Report of proceedings in the Public Works Department (Govt. of India) 1855-56; 1858-59; 1859-60 & 1860-61

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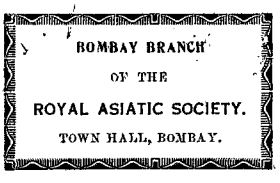

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REPORT

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OF

PROCEEDINGS IN THE PUBLIC WORKS DEPARTMENT,

DURING THE

OFFICIAL YEAR 1855-56.

Reorganization of the Department Public Works.

ALTHOUGH not falling properly within the period embraced in this Report, it appears desirable, before entering on a review of the proceedings in the Department of Public Works as newly organized, to point out the circumstances which led to its reorganization, and to explain concisely the system under which the superintendence and execution of Public Works throughout the Territories under the Government of the East India Company is now carried on.

The unsatisfactory working of the system formerly in force for the superintendence and execution of Public Works had attracted the notice of Government, both at Home and in this Country, and early in 1850, the Honorable the Court of Directors* were induced to order the assembly of a Commission at each Presidency, for the purpose of enquiring into the whole subject. These instructions were carried into effect in December of the same year, and in the following paras. will be shown briefly the result of the measure as it affected each Presidency.

BENGAL AND THE N. W. PROVINCES.

Mily. Cons. 27th Dec. 1850, Nos. 149 to 158.
Mily. Cons. 29th Aug. 1851, Nos. 135 to 149 and 163 to 169.

The Commission appointed in Bengal was composed of Major J. P. Kennedy, late of the Royal Engineers, Major W. E. Baker, of the Bengal Engineers, and Mr. C. Allen, of the Civil Service. The duty entrusted to the Commission was not simply to enquire into the merits or defects of the then existing system, but also to report on the possibility of modifying and amending that system, or of establishing some other, whereby the execution of Public Works could be carried out with greater promptitude and skill and with truer economy.

The Commission submitted their Report in March 1851. They expressed an unanimous and strong conviction of the utter unfitness of the Military Board for the superintendence of Public Works, whether Civil or Military, and they pointed out the mischief and inconvenience which would of necessity result from the attempt of such a body to control and direct the Department; nor was this to be wondered at—charged with the direction of the enormous and important Department of Public Works, of the Army Commissariat, of the Government Studs, of the Ordnance, and therein of the Foundry, the Gun Manufactory, the Gun Carriage Agency, and the Arsenals, as well as of the Military Equipment of the Army—charged moreover with the account and audit of the expenditure of these several Departments, as well as with the execution and direction

* Honorable Court's Public Letter No. 2, dated 30th January 1850.

of them, it was physically impossible that the Military Board could satisfactorily conduct so huge and unmanageable a mass of public business, or get through it without such delays as were equally harassing and injurious to the Officers of the Department, to the Government of the country, and to the public interests.

It is unnecessary to introduce into this Report, at any length, the grounds on which the conclusions arrived at by the Commission were based; suffice it to state, that those conclusions, founded on reliable facts and fair inferences, were plainly set forth and received the concurrence of every authority in the land.

Convinced of the impracticability of improving the old system by any conceivable modifications of it, the Commission suggested an entirely new scheme for the management of the Department, which scheme was eventually adopted with the consent of the Honorable Court.*

The principal features of this scheme were—

First.—That the control of the Department of Public Works should be taken from the Military Board and vested in Provincial Chief Engineers.

Second.—That each Provincial Government should exercise control over Public Works, Civil and Military, in its respective Provinces, under certain limitation of power in respect to the sanction of new projects.

Third.—That the Chief Engineers should be assisted by Superintending and Executive Engineers.

Fourth.—That the separate Office of Chief Engineer, as before constituted, should be abolished.

MADRAS.
Home Cons. 11th Aug. 1854, Nos. 32 to 42.
P. W. Cons. 30th Nov. 1855, Nos. 1 to 5.

The Madras Commission was composed of Mr. Bourdillon, of the Civil Service, Major F. C. Cotton, of Engineers, and Major Balfour, of Artillery. The Report submitted by them is a document replete with interest, ability and usefulness. It embraces the whole question of Public Works in all its branches, displays great knowledge and minute research, and altogether forms a complete text-book for future reference.

The Commission described the Department of Public Works in Madras as consisting of three Divisions:—

First.—The Public Works Department of the Board of Revenue.

Second.—The Superintendent of Roads.

Third.—The Military Board.

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* Public Letter No. 25 of 1852, dated 3rd March.

The Board of Revenue had the control of all Irrigation Works, all Civil Buildings in the Provinces, and all Roads and Bridges not included in the Trunk Roads and Military Cantonments.

The Superintendent of Roads had the sole superintendence of the great lines of communication, which were classed under the term "Trunk Roads." He proposed all new roads on these lines, as well as all repairs and improvements, and he and his subordinates executed the greater part of the work.

The Military Board had the superintendence of the construction and repair of Fortifications, of Roads and Bridges, and all Public Buildings, both Civil and Military, at the Presidency, of all Military Buildings and Forts in the Provinces, and of Roads, Bridges, &c., in Military Cantonments, as well as of the Roads, Bridges, Civil Buildings and other Works in the Saugor Division.

This three-fold management, the Commission recommended, should be abandoned and replaced by a Board of Public Works, which they recommended should consist of a Revenue Officer of the Civil Service and two Officers of the Corps of Engineers, and which should have the entire control and direction of all Public Works, Civil, Military, and Miscellaneous, throughout the Presidency.

Other valuable suggestions, with respect to the future management of the Department, were also made by the Commission, and after much careful consideration and communication with the Honorable Court, a revised scheme was approved for Madras, as similar to that adopted in Bengal, as the different circumstances of the two Presidencies would admit.

BOMBAY.

Home Cons. 11th Aug. 1854, Nos. 43 to 50.
P. W. Cons. 11th May 1855, Nos. 9 to 15.
P. W. Cons. 29th June 1855, Nos. 3 to 5.

The Commission appointed in Bombay was composed of Colonel G. Moore, Mr. J. D. Inverarity, of the Civil Service, Captain N. B. Turner, of Engineers, and Captain T. Gaisford, of Artillery. Their Report was a clear, sensible, and business-like document, describing the system as it existed, pointing out its faults and deficiencies, and suggesting the measures which appeared likely to prove effectual in correcting them.

In the Bombay Presidency, the Public Works Department was under one controlling authority, the Military Board, to whom were subordinate the Superintending Engineers of Provinces, the Executive Engineers, and the Assistants in various grades. The Superintendent of the Department of Roads and Tanks, which was apart from the rest of the system, occupied, in relation to the Board, the position of a Superintending Engineer. The faults which were found in practice to attach to this system were delays in projecting works and in obtaining sanction for the projects, delays in execution, and delays in account.

The Commission proposed to retain the agency of the Military Board. Their recommendations in regard to the future management of the Department were, in other respects, generally similar to those proposed for the other Presidencies; but with the assent of the Honorable Court, a scheme similar in essential points to those sanctioned for Madras and Bengal was approved also for Bombay.

Establishments for the Public Works Department in the Punjab, and in the Provinces of Pegu, Tenasserim and Martaban, Nagpore, Mysore, the Assigned Districts of Hyderabad, and the Province of Oude, have either already been, or are in course of being, organized under the control of Chief Engineers, who correspond through the respective Commissioners with the Government of India.

Formation of a separate Department of the State for the consideration of questions connected with Public Works.

Home Cons. 11th Aug. 1854, No. 51.

The complete reorganization of the Department having thus been resolved upon, it became evident that the measure would be incomplete, unless the Supreme Government was provided with some agency to enable it to exercise, with the weight of scientific knowledge and with authority and system, the universal control confided to it. The establishment of a separate Department of the State, for the consideration and direction of all questions connected with Public Works, could not but be attended with great public benefit, and it was therefore recommended to the Honorable Court, that an Office of "Secretary to the Government of India in the Department of Public Works" should be created. The proposal received the assent of the Home Authorities and this new branch of the Secretariat was inaugurated on the 7th February 1855.

Annual Budgets.

One very important improvement, not noticed above, was introduced with, and indeed forms an essential feature of the new system. Hitherto projects for new works had been submitted singly to the Supreme Government, and recommended by the Local Authorities on grounds and considerations limited to each project, without much reference to the general wants of the country. The evils arising from this isolated mode of considering particular schemes of improvement were obvious, and to avoid these a plan has been adopted, under which all such projects are submitted together, accompanied by tabular Statements, and are considered and disposed of, not as separate works, but as portions of one connected system. These Statements are submitted annually by the Local Governments and Administrations, and not only contain a description of each new work and an estimate of its probable cost, but also show the expenditure that will be needed during the succeeding year for repairs, &c. The Statements are arranged under the following heads:—

1. Works of magnitude requiring the sanction of the Government of India or of the Honorable Court.
2. Works already sanctioned, but not completed.
3. Repairs and contingencies.

By this plan, the most beneficial application of the funds to be expended is secured, the general control over the finances of the country is preserved to the Governor General in Council, and the Supreme Government is relieved from the distraction of attention and waste of time arising from many separate projects of a kindred nature being brought under consideration at different times.

Progress Reports.

But though these Annual Budgets would enumerate the Estimates for new works, and show the amount which it was proposed to spend on repairs and incomplete works already sanctioned, and even, by comparison, from year to year, afford some idea of the progress

of a particular work, at least as regarded expenditure, they would not afford the full and precise information of the actual results achieved under the sanctioned expenditure which is necessary to complete the scheme. It has therefore been decided, that an Annual Progress Report of Public Works in India shall be prepared in the Office of the Secretary in the Public Works Department from materials to be furnished by the Local Governments. This Report will show the expenditure on each project from the commencement and during the year under review, the date of completion if completed, and if not completed, the state of progress. In it will also be noted every circumstance which may have materially affected the progress or cost of the work, or caused any great deviation from the design. Of directly remunerative works, such as Navigable Canals, Turnpike Roads or Ferries, and, generally, of all Works of Irrigation, a separate Statement will be appended to the Report, showing the expenditure in maintenance, the amount of receipts, and the general financial results. Such Progress Report, being an analysis of the Provincial Reports for 1854-55, has already been published as *Selection No. XIII.—India.*

Limits of competence of the Supreme and Local Governments to sanction new works, enlarged.

Under the sanction of the Honorable Court,* the limits of competence of the Supreme and Local Governments to sanction new works has been considerably enlarged; in the former, from Rupees 50,000 to 1 lakh of Rupees, and in the latter, from Rupees 10,000 to Rupees 25,000. The Local Administrations have also been empowered to sanction charges for minor works and for repairs within a smaller limit.

Scheme for the management of the Department.

Auditor of Public Works Accounts.

Revised Code.

A detailed scheme for the management of the Department and for the Offices of Account has been prepared and embodied in a General Order.† The appointment of an Auditor of Public Works Accounts in each Presidency has been strongly recommended to the Court of Directors, and a Committee is now engaged in the preparation of a revised Code for the Department.

Civil Engineering Colleges.

The plan of a Civil Engineering College and Training School for Calcutta, proposed by the Lieutenant-Governor of Bengal, and approved by the Supreme Government, with a suggestion that the College should be accessible to Military Officers, has been accepted, in its general principles, by the Honorable the Court of Directors, who have sanctioned its being carried out, so far as may be practicable, in hired buildings, pending the erection of a suitable edifice.

In Madras, Captain Maitland's Training School was ordered to be incorporated with the Civil Engineering College to be established there, but the Local Government having urged objections to the measure, it has been left to them to carry it out, in a modified form, not involving a departure from the general principles laid down.

The Civil Engineering School at Lahore is to be kept up for three years at an annual expenditure of Rupees 10,080.

A similar School has been sanctioned at Poonah, and will hereafter be incorporated with the Civil Engineering College to be established in the Bombay Presidency.

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* Court's Financial Despatch No. 36 of 1854, dated 20th September. † No. 430, dated 21st April 1854.

The Thomason College at Roorkee has existed for several years, and many of its Students are now usefully employed in the Department of Public Works. The affairs of this College will probably be brought under review in the Report of the Government of the North-Western Provinces.

Admission into the Department, as Apprentices, of youths from Schools in Calcutta.

Cons. 15th June 1855, Nos. 16 to 18.

As a measure calculated, in course of time, to increase the efficiency of the Department, the Government of India, at the recommendation of the Lieutenant-Governor of Bengal, has sanctioned a scheme suggested by Lieutenant-Colonel Goodwyn, Chief Engineer of the Lower Provinces, under which a certain number of youths, possessing a knowledge of Mathematics and the rudiments of Surveying, will be selected from the Martiniere and other Schools in Calcutta, and admitted as Apprentices into the Department, with a view to their being trained for the post of Overseers and Assistant Engineers. These Apprentices will draw a subsistence allowance while under training.

Civil Engineers from England.

A certain number of Civil Engineers and Overseers have also, on the suggestion of the Government of India, been selected and sent out by the Honorable Court to serve under Covenant at each of the Presidencies. Such of these Gentlemen as may acquire the native languages will have suitable employment in the Executive Department and are declared eligible to higher appointments.

Abolition of the Bengal Military Board.

The Bengal Military Board having been abolished on the 1st May 1855, the charge of the Office, and the disposal of a great mass of business, was transferred from that date to the Secretary to the Government of India in the Public Works Department, who has been vested with the powers of the late Board and who was allowed, for a short time, the aid of an Assistant Secretary in disposing of the arrears of the Public Works Department of the Board.

Having thus briefly noticed the points of principal importance connected with the reorganization of the Department Public Works, it remains to give some account of what has been done in that Department during the official year; and in doing so it will suffice to notice only the more important subjects and measures of general application, for it would be superfluous to enter into the details of local projects, which it is presumed will be fully described in the separate Reports which the Local Governments and Administrations have been required to submit annually.

Roads and Bridges.

Bridging the River Hooghly between Calcutta and Howrah.

Cons. 11th May 1855, Nos. 18 to 38.

The question of a communication between Calcutta and Howrah has for some time been under consideration, with special reference to facility of access to the Railway Terminus. The proposal of the East India Railway Company to establish a Steam Ferry, and certain other projects for permanent and floating Bridges, including a design by Mr. Rendel, the Railway Company's Engineer in England, have been under consideration. The Consulting Engineer to Government having been called upon to report on the subject, gave it as his opinion that an efficient Steam Ferry opposite the Railway Terminus was preferable to either a

permanent or a floating Bridge, inasmuch as it would not interfere, like the others, with the convenience of the Harbour, and would suffice for the present wants of the Public and the Railway Company. In this opinion the Government of India generally concurred, and the whole subject has been referred to the Honorable the Court of Directors.

With a view to furnish the Authorities in England with all the information necessary to guide them in deciding on this very important question, a Committee was convened to enquire into and report on the various interests connected with the bridging of the Hooghly at or near Calcutta, and on the position and description of Bridge best suited to the present and prospective wants of the Metropolis. The Committee was composed of Captain T. E. Rogers, Superintendent of Marine, Captain Yule, of Engineers, and T. M. Robinson, Esq., a Merchant of the City of Calcutta.

The Report of the Committee has been submitted to the Government, and is now under consideration.

Land communications in Bengal.

Grand Trunk Road.

Jessore and Cuttack Roads.

The subject of land communications in the Provinces of Bengal, hitherto much neglected, has lately engaged the serious attention of Government. In addition to the Grand Trunk Road, on which measures are in progress for completing the Bridges over all the rivers that cross its course, except the Soane and the Ganges, two other principal lines of communication from the Metropolis have been designed, one Eastward through Jessore to Assam and Burmah, the other South-westward, through the Provinces of Balasore and Cuttack, to meet the great North and South Road from Madras.

Arracan Coast Road.

Roads in Pegu and Martaban.

Roads in the Ganges Valley.

Moorshedabad and Darjeeling and Patna and Gya Roads.

The attention of the Supreme Government has been directed to the prosecution of the work on the Arracan Coast Road from Chittagong Southwards, and its continuation across the Yoma Mountains into the Valley of the Irrawaddee; also to designs for principal lines of Road in Pegu and Martaban. On the general question of Roads in the Ganges Valley, it has been decided that those which are calculated to bring the several Districts into communication with the Railway should first receive attention. The most important of such lines yet brought forward are those from Moorshedabad to Nulhatee and from Peerpointy to the foot of the Darjeeling Hills. The Patna and Gya Road is also of this class.

Great Deccan, Agra and Bombay Roads.

Road from Kurnaul to Roorkee.

Measures have been taken for perfecting the great Deccan Road from Mirzapore to Bombay, and also the Agra and Bombay Road, and an important branch of the Grand Trunk Road from Kurnaul *viâ* Meerut to Roorkee has been under consideration.

Continuation of the Grand Trunk Road towards Lahore and Peshawur.

The continuation of the Grand Trunk Road through the Cis-Sutlej States towards Lahore, and its further extension to Peshawur, have occupied the attention of Government.

Hindoostan and Thibet Mountain Road.

The Hindoostan and Thibet Mountain Road has been steadily advancing to completion, and the section from Simla to the Plains will shortly be open for wheeled carriages.

Roads in the Saugor and Nerbudda Territories and in the Punjab.

In the Saugor and Nerbudda Territories, and in the Punjab, considerable expenditure has been incurred on Secondary Roads.

Roads in the Madras and Bombay Presidencies.

The Madras and Bombay Governments have vigorously prosecuted the extension of their several systems of Trunk and District Roads.

Roads in Nagpore, Hyderabad and Oude.

In the new Provinces, *viz.*, Nagpore, the Assigned Districts of Hyderabad and Oude, measures have been taken to obtain projects for road improvements, but time has not admitted of much being done towards that object.

Canals and Irrigation.

Damoodah Embankments.

Cons. 4th May 1855, Nos. 167 to 178.

No. XII. Printed Selections of the Bengal Government.

The subject of the Damoodah Embankment is one of much importance. The quantity of water liable to be poured into the river has been found to be very greatly in excess of what its bed can possibly contain, without raising Embankments to a height that would be very expensive and extremely dangerous. Several projects have from time to time been suggested by Engineers for removing, or at least mitigating, the evils which result from frequent breaches in the existing Embankments, and all these projects have received the anxious and careful consideration of the Government.

The remedial measures which have been suggested may be stated as—

First.—Strengthening and heightening the Embankments for the discharge of the full flood.

Second.—Widening the channel by retiring the Embankments on one or both sides of the river, till sufficient water-way is secured.

Third.—Removing the Embankments on the right bank of the river; so as to allow the surplus flood waters to flow free over the country, between the Damoodah and Roopnarain Rivers

Fourth.—Retaining the existing Embankments and providing a surplus flood channel on the right, leading lower down into the tidal bed.

Fifth.—Retaining the existing Embankments and providing a capacious channel on the right to the great bend of the river, and thence on the left bank to the North of Oolabarria, embracing within its course the Canna Nuddee or old Damoodah and Kansonah Khal, thus carrying the surplus flood waters into the Hooghly above the Calcutta and Midnapore Road.

The adoption of any one of these projects would be attended with risks, but amid a choice of difficulties, the Local Government gave the preference to the third, which had the advantage of having been to a great extent already tested, such large breaches having been left open on the right bank during two seasons as nearly to amount to an anticipation of the plan of removal.

As there were sufficient grounds in the professional opinions given to sanction the removal of 20 miles of Embankment on the right bank above and below Burdwan, this was ordered to be done as soon as sufficient precautions had been taken and ample warning given to secure the safety of the people whose lands would be affected by the inundation. The remainder of the Embankment on the right bank will not yet be removed.

All professional opinion however concur in regarding the partial removal of the Embankments as a mere temporary remedy. The removal of all artificial obstructions to the course of the river on both its margins was advocated in 1846, by a Committee, of which Mr. Simms and Colonel Sage were members, but that opinion was based only on a general theory, without any Topographical Survey, and it has therefore been deemed advisable to have a systematic scientific enquiry undertaken into the Topography levels and drainage of the country on the left bank of the Damoodah, so as to supply data for determining the propriety or necessity of levelling, at a future day, the Embankments on that side also. These enquiries are now in progress.

The important question of the compensation to be allowed on account of the lands which are no longer to be protected from inundation has been transferred for consideration to the Home Department, and the attention of the Local Government has been drawn to the question of the protection or abandonment of the Calcutta and Midnapore Road, the safety of which is involved in these proceedings.

Project for the irrigation of the Districts of Shahabad and Behar.
Cons. 19th Oct. 1855, Nos. 140 to 144.

A comprehensive project for the irrigation of the Districts of Shahabad and Behar was laid before the Government by Captain C. H. Dickens, of Artillery, and as the Government attached the highest importance to the various objects proposed by that Officer and placed great reliance on the accuracy and sufficiency of the data on which his project was founded, it has been recommended to the Court of Directors in the strongest terms, and in full confidence that the results of this important measure will, in every point of view, be equally beneficial to the State and to the Country.

Survey of the Kursoa.
Cons. 5th April 1855, Nos. 7 to 9.
Cons. 15th June 1855, Nos. 36 to 41.

An examination of the Kursoa, a branch of the River Brahmini in Cuttack, was resolved upon, because it was thought very desirable to improve the outlets of the rivers on that Coast, not only with the view of facilitating traffic, but in order to relieve the Embankments by providing a wider outlet for the waters of those streams.

Periodical inundations of the Cuttack and Pooree Districts.

Lieutenant Harris, the Executive Engineer, Cuttack Division of Embankments, has been relieved temporarily of his duties and directed to devote his whole time and energy to the investigations of the best means of controlling the rivers (the Mahanuddy and its branches) which periodically inundate the Cuttack and Pooree Districts.

Opening out the Bassein branch of the Irrawaddy River to navigation throughout the year.

The position of the Bassein River, as regards the main stream of the Irrawaddy, is nearly analogous to that of the Nuddea Rivers, as regards the main stream of the Ganges. The head of the Bassein River appears to have shifted from time to time, and the

position it now occupies being peculiarly unfavorable to the free action of an entering current, it has become almost entirely choked with silt.

For the restoration of this channel as a navigable branch of the Irrawaddy, which has been recognised as an object of vast importance, a method has been suggested by Mr. Login, who proposes to form a new head to the Bassein branch in a more favorable position. The new channel is to be artificially excavated only to a slight depth, and is to be scoured out to the requisite depth by a current directed into it by the action of floating break-waters. This project has been recommended to the Home Authorities.

It was at one time supposed that the re-opening of the communication between the two rivers might have been effected by means of a Canal with locks, but the water in the upper parts of the Bassein River is so shallow that such a Canal would have to be carried 20 miles below the point selected for the mouth of the cut suggested by Mr. Login, and would prove more costly than that gentleman's project. The possibility also of maintaining a masonry head in an alluvial soil on the bank of so vast a river as the Irrawaddy appeared very doubtful.

Bund on the right bank of the River Indus, near Dehra Ghazee Khan.
Cons. 15th June 1855, Nos. 271 to 273.

A low tract of land, from 5 to 8 miles broad, on the right bank of the Indus, between Dehra Ghazee Khan and the mountains, was subject to an annual inundation, which cut off for the time all communication between the Town and Cantonment of Dehra Ghazee Khan and the frontier posts, and entailed an annual loss of about Rupees 73,000, more than a third of which fell upon the Government.

Other remedial measures having been attended with but partial success, a bund 11 miles long obliquely across the inlet to the depressed tract of land has been constructed at a cost of Rupees 65,607-2-2.

Kylas Canal.
Cons. 21st Sept. 1855, Nos. 20 to 79.

This is a new Canal for irrigation to be constructed in Rohilcund, at a cost of about Rupees 84,000. The work, it is expected, will not only be of great benefit to the country, but will also prove very remunerative.

Ganges Canal.

The works in completion of this magnificent scheme of the Ganges Canal have been steadily advancing. The latest Report of Colonel R. Baird Smith, the Director of Canals in those Provinces, is about to be printed as a *Selection from the Records of the Public Works Department.*

Canals. &c., connected with the Godavery Works in Rajahmundry.

Madras Budget 1855-56.

1.	Samulcotta and Tonee Navigable Canal, ...	Rs.	2,34,304	9 11
2.	Samulcotta and Cocanada ditto, ...	„	1,17,339	0 0
3.	Mogultoor to Cocanada ditto, ...	„	1,22,357	0 0
4.	Irrigation and Navigation Works in the Central Delta,	„	3,15,932	0 0
5.	Kistna Anicut and Ellore Navigable Canal, ...	„	2,14,384	10 2
6.	Masulipatam and Poolai Canal, ...	„	2,37,106	12 0
7.	Toongobuddra and Guntoor ditto, ...	„	1,46,786	13 11
8.	Extension of the Eastern Coast Canal, from Doogooraz-patam to the Kistnapatam back-water, ...	„	1,39,664	15 8

The projects noted on the margin, which are estimated to cost in the aggregate about Rupees 15,25,000, form part of a noble line of internal navigation.

They are parts of the Godavery and Kistna anicut systems, and being available for irrigation, as well as navigation, will largely develop the useful effect of these magnificent works.

MISCELLANEOUS.

HARBOURS, BUILDINGS, &c.

CIVIL.

Strand Bank, Calcutta.
Cons. 18th May 1855, Nos. 9 to 12.
Cons. 13th July 1855, Nos. 5 and 6.

The question of opening the Strand Bank at Calcutta as a Public Wharf, and of placing a number of pontoon landing stages along it, to facilitate the landing and shipping of goods, is under consideration.

Improvement of the Coringa and Cocanada Harbours.
Madras Budget, 1855-56.

The improvement of the Coringa Harbour will cost about Rupees 63,000. The principal work is the straightening and shortening of the channel, which runs North parallel with the Coast from the Godavery Delta to Coringa, and carries, during the freshes, a considerable volume of the Godavery water. This measure, it is expected, will produce a scour and keep open the mouth of the Channel. The earth obtained from the excavation of the new cuts is to be heaped up as an island of refuge for the inhabitants on the occurrence of sea inundations.

For the improvement of the Cocanada Harbour, it is intended to face both the banks with stone, and run them out as groynes, so as in fact to extend the river into deep water and thus to keep the mouth open by means of the scour, which, it is expected, will be obtained from the reflux of the tide. This work will cost about Rupees 84,639.

Timber Depôt in the Coast near Colaba (Bombay.)
Cons. 14th Sept. 1855, Nos. 7 to 19.

The ground required for this Depôt is to be obtained by walling out the sea on a part of the Coast near Colaba and filling up the interior space with sand. The site selected is stated by the Local Authorities to be the most convenient available, and a Timber Depôt is considered by them to be an urgent want.

New Post Office in Calcutta.
Cons. 25th May 1855, Nos. 25 to 28.

The design for a new Post Office in Calcutta was originally prepared by the late Major General Forbes, in communication with the Post Office Committee, but was subsequently modified in some important particulars by Lieutenant-Colonel Goodwyn. Thus modified, the building was estimated to cost Rupees 3,34,982-3-9. The design did not however meet the approval of the Honorable the Court of Directors, who requested the opinion of the Government as to the possibility of procuring a better design, by inviting competition in India. As an alternative to this method, the Honorable Court proposed to ask the advice of an eminent Architect in England, but required a full specification of the wants of the Post Office and Electric Telegraph Establishments, both of which are to be accommodated in the same building.

It was decided by the Government to adopt the latter course, as it was understood that the Director General of the Post Office of India, then in England, would be in communication with the Honorable Court regarding the affairs of his Department.

Calcutta Presidency College.
Cons. 30th March 1855, Nos. 12 to 14.
Cons. 14th Sept. 1855, Nos. 13 to 38.

A design for the Calcutta Presidency College was submitted to the Home Authorities, but was objected to, and a revised design is now under preparation by Lieut.-Colonel Goodwyn.

Legislative Council Chamber.
Cons. 21st Jan. 1856, Nos. 174 to 176.
Cons. 22nd Feb. 1856, No. 89.
Cons. 18th April 1856, Nos. 109 to 112.
Cons. 13th June 1856, Nos. 85 and 86.

A Hall for the meetings of the Legislative Council is to be added to the Government Building lately occupied by the Home Department. This, with other improvements, is calculated to cost about Rupees 29,000.

Jail at Prome.

Cons. 28th Feb. 1856, Nos. 557 to 559.

An Estimate, amounting to Rupees 1,13,304, with a plan for a Brick-work Jail at Prome, was submitted to Government by the Commissioner of Pegu, who was anxious that a building of non-combustible materials should be erected as speedily as possible. The Estimate has been recommended to the Honorable the Court of Directors, and the design will be modified in conformity with suggestions offered by the Inspector of Prisons.

Military.

Very large expenditure has been incurred on Military Buildings, owing partly to the formation of new Cantonments in the Punjab and Pegu and partly to the determination of Government to afford greatly improved accommodation to the European Troops. Large and expensive Barracks and other buildings have either already been constructed, or are in course of construction, while others have been sanctioned, but have not yet been commenced. The Reports of the Local Governments will contain a description of the nature and cost of each of these works, and it will therefore suffice to show in the margin some of the Stations for which the most costly of these buildings have been sanctioned.

Fort William.
Cooly Bazar.
Rangoon.
Tounghoo.
Nanyan.
Ferozepore.
Sealkote.
Rawal Pindee.
Peshawur.
Nowsheera.
Deesa.
Dugshai.
Mooltan.
Belgaum.
Ahmednuggur.
Secunderabad.

Barracks for Europeans Troops.

It is under contemplation to fix a standard plan of Barracks for European Troops for the plains of India, with their necessary adjuncts of Hospitals, &c. The several Local Governments have, with this view, been called upon to furnish Plans and Estimates of all such Barracks now in existence, together with a design to be prepared by the Engineer Department, in consultation with the Military Authorities, such as the respective Governments may be able to recommend as a standard design.

School Rooms, Bakeries, Slaughter Houses, Fives' Courts, Skittle Alleys.

Designs have also been called for of School Rooms adapted to the improved system of Education for European Troops serving in India, as also of Bakeries and Slaughter Houses, of Fives' Courts, Skittle Alleys, &c.

Drainage of the Peshawur Cantonment.

Cons. 13th July 1855, Nos. 183 to 185.

This work has been undertaken with a hope of improving the salubrity of this Cantonment. The measure, it is roughly calculated, will involve an outlay of Rupees 1,06,400. Steps are also in contemplation for the supply of water to the Cantonment.

Expenditure in 1853-54, and Estimated Expenditure for 1854-55.

The following Abstracts will show the recorded expenditure in Public Works for the year 1853-54 and that estimated for the year 1854-55. They are based on general Statements of the Public Works expenditure in the several Presidencies furnished by the Finance Department, but the data for the sub-division and classification have been obtained in part directly from the Local Governments and in part from Progress Reports and other documents furnished by the Executive Department.

From these Statements, which however are confessedly incomplete, it would appear that the actual expenditure on new works for 1853-54, added to that estimated for 1854-55, for the same object, amounted to $3\frac{1}{2}$ crores of Rupees, exclusive of $2\frac{1}{4}$ crores expended in maintenance of existing Works, Establishments, &c.

EXPENDITURE on Public Works in 1853-54.

Classes of Work.	Salaries, Establishments, and Miscellaneous Expenses.	Repairs.	New Works.	Land rented and purchased.	Total.
Churches, Public Offices, Jails, and Miscellaneous Buildings and Works ..	18,12,399	5,37,129	5,44,387	31,416	29,25,331
Embankments ..	Included in the above	5,70,958	....	....	5,70,958
Roads and Bridges ..		18,28,558	39,76,634	12,547	58,17,739
Light-houses, Dock-yards, and Harbours ..		45,930	1,12,115	11,000	1,69,045
Inland Navigation ..		28,209	42,679	....	70,888
Irrigation Works ..	9,67,109	24,67,777	38,73,822	71,450	73,80,158
Railroads. Charges for Government Officers and for Lands supplied to private Companies working under Government guarantee	97,586	....	....	1,64,501	2,62,087
Electric Telegraph ..	38,183	....	10,19,736	....	10,57,919
Military ..	12,37,365	9,56,349	33,70,092	1,39,974	57,03,780
Unclassified ..	....	....	21,69,485	....	21,69,485
Total ..	41,52,642	64,34,910	1,51,08,950	4,30,888	2,61,27,390

Estimate for 1854-55.

Classes of Work.	Salaries, Establishments, and Miscellaneous Expenses.	Repairs.	New Works.	Land rented and purchased.	Total.
Churches, Public Offices, Jails, and Miscellaneous Buildings and Works ..	18,63,637	5,14,200	15,42,225	1,192	39,21,254
Embankments ..	Included in the above	6,36,500	....	1,000	6,37,500
Roads and Bridges ..		14,28,560	61,86,566	40,000	76,55,126
Light-houses, Harbours, and Dock-yards ..		31,801	1,10,241	....	1,42,042
Inland Navigation ..		....	2,80,000	....	2,80,000
Irrigation Works ..	10,59,500	20,27,236	64,13,985	1,05,000	96,05,721
Railroads ..	93,000	....	....	1,34,800	2,27,800
Electric Telegraph ..	64,800	....	5,38,000	....	6,02,800
Military ..	9,39,600	8,16,651	59,56,510	....	77,12,761
Unclassified ..	....	....	3,73,522	....	3,73,522
Total ..	40,20,537	54,54,948	2,14,01,049	2,81,992	3,11,58,526
Grand Total for two years ..	81,73,179	1,18,89,858	3,65,09,999	7,12,880	5,72,85,916

DETAILS of the principal items of Expenditure on New Works.

PRESIDENCY OR PROVINCE.	Names of the Works.	Expenditure as per Accounts of 1853-54.	Estimated for 1854-55.
	Churches, Public Offices, Jails, and Miscellaneous Buildings and Works.		
	The new Works included in the first item of the foregoing Statement are in very few instances specified in the Financial Statements, and are very numerous, and for the most part not of any large amount.		
	Embankments.		
	The Expenditure on Embankments includes renewals and new Works, as well as repairs, but the whole Expenditure is entered under the single head "Poolbundee."		
	Roads and Bridges.		
BENGAL ..	New Works on the Grand Trunk Road, namely, the Bridges over the Muggra and Sautgong Khals, the Leelajun, Morhur, Boorkya, Bootana and Borakur Rivers, the Viaduct over the Doorgowtee flood, and the Causeway in the bed of the Soane ..	1,17,827	
	The Patna and Gya Roads ..	0	
	The Dacca and Arracan Road ..	2,92,186	8,22,000
	The Tonghoop Road ..	81,427	
N. W. PROVINCES.	The Hindoostan and Thibet Road ..	56,409	
	New Works on the Grand Trunk Road in the N. W. Provinces ..	4,16,703	2,60,000
	New Works on the Great Deccan Road ..		
	" " " Agra and Bombay Road ..		
PUNJAB ..	Grand Trunk Road from Kurnal to Lahore ..	20,26,093	1,19,578
	Lahore and Peshawur Road ..		17,95,821
	Other Roads in the Punjab ...		4,08,191
MADRAS ..	Trunk Roads in the Madras Presidency ..	2,95,145	4,10,756
	Constructing Roads in Bellary to provide for the poor during the scarcity ..	2,45,083	1,07,160
	Ditto ditto ditto in Nellore ..	54,000	70,577
	District Roads ..	2,53,350	14,50,549
BOMBAY ..	Poona and Sholapore Roads ..	0	1,11,224
	Other Roads in Bombay and Scinde ..	Not separated from repairs	5,89,620
BENGAL & PEGU	" " " Bengal and Pegu ..	1,38,461	41,090
	Total ...	39,76,634	61,86,566
	Light-houses, Dock-yards, and Harbours.		
BENGAL ..	Saugor Light-house ..	55,000	
MADRAS ..	Improving the Harbours of Cuddalore and Porto Novo ..	19,915	25,155
	Deepening the Coring Bar ..	0	36,000
BOMBAY ..	Extension of the Musjid Bunder ..	16,986	6,986
	Lengthening the Upper Duncar Dock ..	9,801	627
SCINDE ..	Permanent Pier at Keamara ..	10,413	
BOMBAY & SCINDE	Minor Works ..	0	41,496
	Total ..	1,12,115	1,10,241

Presidency or Province.	Names of the Works.	Expenditure as per Accounts of 1853-54.	Estimated for 1854-55.
	Inland Navigation.		
Bengal ..	New Canal at Oolta Danga, Calcutta ..	0	1,92,000
	Improvement of Tolly's Nullah ..	0	58,000
Madras ..	Canal from between Ponamy and Choughaut to the Muttawar Road in Nillalabar ..	25,211	
	Improving the Navigation of the Godavery ..	0	30,000
	Works in the Paun-baun Channel ..	12,971	
	Minor Works ..	4,497	
	Total ..	42,679	2,80,000
	Irrigation Works.		
N. W. Provinces..	The Ganges Canal, improving the Eastern Jumna Canal, and other Works ..	19,56,603	38,00,000
Punjab ..	Baree Doab Canal and other Works ..	10,13,913	12,81,911
Rajpootana ..	Irrigation Works at Ajmeer ..	0	5,000
Madras ..	Godavery Anicut and Channels, Kistna Anicut, and several other Works ..	9,03,306	11,47,503
Bombay & Scinde	Irrigation Works in Bombay and Scinde ..	Not separated from repairs	1,79,571
	Total ..	38,73,822	64,13,985
	Military Works.		
Punjab ..	Fort at Abvozai ..	50,000	
Bombay ..	New Powder Magazine ..	9,664	
Aden ..	Fortifications and Barracks at Aden ..	85,682	1,24,607
Scinde ..	Arsenal and Powder Magazines at Kurrachee ..	40,917	
Punjab ..	Barracks, &c., at Peshawur ..	1,03,427	
Ditto ..	Levelling and Road-making at ditto ..	2,63,000	
Ditto ..	Barracks, &c., at Lahore ..	6,56,532	
	„ „ „ Sealkote ..	6,50,252	
	„ „ „ Rawal Pindee ..	2,80,032	
	„ „ „ Nowshera ..	2,19,588	
Pegu ..	„ „ „ Rangoon ..	1,89,729	
Bengal ..	„ „ „ Darjeeling ..	41,290	
Madras ..	„ „ in the Neilgherries ..	1,08,662	50,000
	„ „ at Secunderabad ..	0	4,00,000
Scinde ..	„ „ „ Kurrachee ..	1,02,077	57,885
	Other smaller Works too numerous to detail ..	6,69,320	3,54,018
Bengal ..	For the Lower Provinces generally ..	0	1,00,000
N. W. Provinces..	„ „ Punjab and N. W. Provinces ..	0	37,00,000
Pegu ..	„ Pegu ..	0	10,00,000
Madras ..	„ Madras ..	0	1,70,000
	Total ..	38,70,192	59,56,510

Unclassified.

This head includes items entered in the Financial Statement as "Advances for the construction of Public Works," of which the details could not be obtained from other sources.

THE following Statements relate to the Official Year under report:—

No. 1 shows the aggregate amount of the *Estimates* for works to be commenced or continued during the year 1855-56.

No. 2 contrasts the Revenue with the amount of *Expenditure* sanctioned for the same works.

This latter Statement shows the proportion of Gross Revenue to be expended on Public Works in 1855-56 to be—

For Punjab	44½
„ Scinde	24½
„ Madras	10
„ Bombay (exclusive of Scinde)	6½
„ North-Western Provinces	5
„ Bengal	3

No. 1.

No. 1.

	Bombay Presidency.			Madras Presidency.			Bengal.			North-Western Provinces.			Punjab.			Pegu.			Straits' Settlements.			Total Estimates for 1855-56.
	Total Estimate submitted or proposed.	Amount already expended.	Amount authorized for the year 1855-56.	Total Estimate submitted or proposed.	Amount already expended.	Amount authorized for the year 1855-56.	Total Estimate submitted or proposed.	Amount already expended.	Amount authorized for the year 1855-56.	Total Estimate submitted or proposed.	Amount already expended.	Amount authorized for the year 1855-56.	Total Estimate submitted.	Amount already expended.	Amount authorized for the year 1855-56.	Total Estimate submitted.	Amount already expended.	Amount authorized for the year 1855-56.	Total Estimate submitted.	Amount already expended.	Amount authorized for the year 1855-56.	
Statement No. 1.—Sanctioned.																						
Military	1,63,993	.....	99,070	.....	.....	.....	.....	.....	.....	1,00,000	.....	71,000	2,08,126	.....	.....	.....	.....	.....	.....	.....	.....	39,070
Public	1,78,497	.....	1,08,877	7,55,537	.....	4,06,108	.....	.....	.....	.....	.....	.....	2,45,000	.....	.....	.....	.....	.....	53,287	.....	12,000	6,34,985
Judicial	.....	.....	.....	.....	.....	.....	84,000	.....	84,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	25,000	.....	10,000	44,000
Ecclesiastical	39,328	.....	35,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	40,000	.....	20,000	42,000
Educational	.....	.....	.....	.....	.....	.....	12,00,084	.....	2,00,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,00,000
Revenue (General)	28,516	.....	28,516	.....	.....	.....	63,434	.....	63,434	56,572	.....	40,000	1,20,547	.....	.....	.....	.....	.....	.....	.....	.....	1,31,968
Revenue (Irrigation)	.....	.....	.....	3,15,932	.....	2,00,000	.....	.....	.....	1,67,712	.....	1,08,812	2,61,510	.....	.....	.....	.....	.....	.....	.....	.....	2,08,812
Local	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Marine	.....	.....	.....	1,47,479	.....	1,47,479	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,47,479
	4,07,472	.....	2,81,463	12,19,247	.....	7,73,587	13,47,518	.....	4,47,434	3,24,284	.....	2,14,812	10,29,983	.....	.....	.....	.....	.....	1,18,287	.....	49,000	
Statement No. 1.—Recommended to the Hon'ble Court.																						
Military	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Public	3,17,981	.....	81,413	7,37,944	.....	4,28,350	7,60,986	.....	3,00,000	5,86,225	.....	3,09,193	.....	.....	.....	.....	.....	.....	.....	.....	.....	10,19,556
Judicial	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ecclesiastical	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Educational	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Revenue (General)	1,74,074	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	74,000
Revenue (Irrigation)	.....	.....	1,74,001	4,74,001	.....	3,37,239	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,37,239
Local	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Marine	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	4,91,055	.....	1,55,413	12,11,945	.....	7,65,589	7,60,986	.....	3,00,000	5,86,225	.....	3,09,193	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Statement No. 2.																						
Military	48,50,209	31,63,946	8,79,085	10,49,964	6,03,310	2,98,809	7,31,490	1,69,114	3,17,922	2,49,451	2,14	2,06,79	54,47,751	16,52,837	.....	.....	16,42,265	12,12,096	.....	.....	.....	28,53,154
Public	28,23,207	5,09,344	12,01,482	51,53,154	11,88,178	17,82,278	22,96,722	5,41,279	17,29,178	6,86,48	5,72,813	2,31,937	65,82,162	6,16,244	.....	65,240	4,92,279	3,79,760	.....	.....	.....	40,76,152
Judicial	1,54,855	23,102	1,09,102	99,863	15,634	84,229	2,66,619	46,338	2,15,424	26,702	9,058	11,189	6,48,822	54,091	1,31,339	.....	.....	.....	.....	.....	.....	5,41,427
Ecclesiastical	70,295	7,964	62,330	6,547	3,038	3,509	14,192	200	10,492	9,979	40	9,938	1,31,594	28,271	.....	.....	.....	.....	.....	.....	.....	85,968
Educational	.....	.....	.....	.....	.....	.....	11,496	500	10,996	5,478	1,801	4,038	.....	.....	.....	.....	.....	.....	.....	.....	.....	15,034
Revenue (General)	1,24,193	21,927	92,245	9,871	573	9,291	2,47,468	69,681	1,77,625	42,272	1,920	40,352	14,468	.....	.....	1,00,000	.....	20,000	.....	.....	.....	2,42,512
Revenue (Irrigation)	18,33,060	2,20,208	6,15,878	20,80,851	15,02,720	10,76,317	9,11,707	71,810	8,32,526	1,46,1,07	1,24,54,660	18,14,000	29,92,275	25,02,136	.....	.....	.....	.....	.....	.....	.....	44,20,721
Local	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Marine	97,650	45,012	52,622	1,80,548	21,034	86,702	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,09,497	61,577	1,56,220	.....	.....	.....	2,86,044
	1,00,53,811	30,51,501	31,12,278	75,80,250	32,34,486	34,51,135	44,31,922	12,07,513	33,35,163	1,56,64,594	1,27,83,253	24,71,718	1,82,31,754	50,53,910	.....	10,32,719	22,31,319	80,00,657	.....	.....	Punjab	60,00,000
Grand Total (inclusive of the sums recommended)	1,00,92,739	30,55,601	33,29,152	90,11,448	32,34,486	42,00,479	61,70,426	12,07,513	61,82,597	1,61,75,102	1,27,83,253	29,06,163	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,47,48,210
Ditto (exclusive of ditto)	1,04,46,388	30,55,601	33,75,730	87,69,502	32,34,486	42,24,781	58,39,440	12,07,513	29,82,597	1,59,88,979	1,27,83,253	28,86,573	1,82,31,754	50,53,910	*60,00,000	10,32,719	22,31,319	†80,00,657	.....	.....	.....	

* The sum of 60,00,000 includes Annual Repairs and Establishment.

† This sum is merely an Estimate.

COMPARATIVE STATEMENT of the Gross Revenue of the under-mentioned Provinces, and the amount of Expenditure on sanctioned Works for 1855-56.

PRESIDENCY OR PROVINCE.	Gross Revenue in 1854-55.		Amount of Expenditure authorized for 1855-56.	Per-centage upon Gross Revenue.
BOMBAY ..	4,83,37,670	Large Works above 25,000	31,53,551	6 8 per cent.
		Works below 25,000	3,75,691	0 12 per cent.
			35,29,152	7 4 per cent.
MADRAS ..	5,00,19,357	Large Works above 25,000	41,20,949	8 4 per cent.
		Works below 25,000	8,69,721	1 12 per cent.
			49,90,670	10 0 per cent.
BENGAL ...	11,76,18,484	Large Works above 25,000	35,56,201	3 0 per cent.
		Works below 25,000	6,26,396	0 8 per cent.
			41,82,597	3 8 per cent.
N. W. PROVINCES	6,20,45,500	Large Works above 25,000	26,24,397	4 3¾ per cent.
		Works below 25,000	3,71,766	0 9½ per cent.
			29,96,163	4 13½ per cent.
PUNJAB ...	1,34,84,500	... ...	60,00,000	44 8 per cent.
BOMBAY ...	4,83,37,670	... ...	35,29,152	
Less—SCINDE ...	25,72,980	... ...	6,30,347	24 0½ per cent.
BOMBAY, *exclusive* OF SCINDE ...	4,57,64,690	... ...	28,98,805	6 4 per cent.

RAILWAYS.

EAST INDIAN RAILWAY COMPANY.

THE subject of Railway communication in India, was first laid before the Supreme Government by Mr. R. Macdonald Stephenson, in 1843; and in 1845, the Honorable Court appointed Mr. Simms to be Consulting Engineer to the Government of India in the Railway Department.

In 1845, Mr. Simms was instructed, in concert with two Engineer Officers, Captains Boileau and Western, to examine and report upon a direct line from Calcutta to Benares, and to report generally whether there was any thing in the soil or climate of India, or in the habits of its population, inimical to the introduction of Railways. The Report of this Committee was favorable alike in the local and general questions.

In 1849,* the Honorable East India Company entered into a contract,† with the East Indian Railway Company, for the construction of an experimental line, which was to cost one million sterling, and to be selected with a view to its forming a portion of a trunk line to the North-Western Provinces. Mr. Simms reported‡ on the subject in April 1850. The Governor General recorded a Minute,§ recommending the line from Howrah to Raneegunge.

This was sanctioned by the Honorable Court,‖ and work was commenced in the latter end of 1850, when Major Kennedy was appointed Consulting Engineer, in succession to Mr. Simms, and submitted a Report,¶ in which he advocated the Ganges Valley line in preference to the more direct hilly route. The Most Noble the Governor General** concurred generally in Major Kennedy's views, which were also approved by the Honorable Court.††

In March 1851, Major Kennedy returned to Europe, and was succeeded by Major W. E. Baker. In the end of 1851, a line‡‡ was surveyed, and reported§§ on, between Burdwan and Rajmehal, and an extension of the Railway Company's Capital by £1,000,000‖‖ was sanctioned for the purpose of executing this line.¶¶

In the cold weather of 1852-53,*** a line was surveyed from Rajmehal to Allahabad, and reported on, and in April 1853,††† the Governor General's celebrated Railway Minute was recorded, and the construction, by the East Indian Railway Company, of a line, from Burdwan to Delhi, was soon afterwards sanctioned by the Honorable Court,‡‡‡ and interest was guaranteed on a Capital of £9,000,000, inclusive of the £1,000,000§§§ already sanctioned for the Rajmehal extension.

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* Honorable Court's Financial Despatch, No. 270, of 1849, dated 14th November.
† Deed of Contract, dated 17th August 1849.
‡ Mr. Simms's Report, dated 29th April 1850.—*India Selection*, No. I, p. 1.
§ Minute by the Most Noble the Governor General, dated 4th July 1850.
‖ Honorable Court's Financial Despatch, No. 46 of 1850, dated 4th December.
¶ Major Kennedy's Report, dated 29th January 1851.—*India Selection*, No. I, p. 33.
** Minute by the Most Noble the Governor General, dated 8th February 1851.
†† Honorable Court's Financial Despatch, No. 45 of 1851, dated 20th August.
‡‡ *India Selection*, No. I, pp. 83 to 94.
§§ Minute by the Most Noble the Governor General, dated 15th March 1852.
‖‖ Honorable Court's Financial Despatch, No. 45 of 1852, dated 8th September.
¶¶ Deed of Contract, dated 15th February 1854.
*** Parliamentary Blue Book, p. 4.
††† Parliamentary Blue Book, p. 113.
‡‡‡ Financial (Railway) Despatch, No. 8 of 1853, dated 17th August.
§§§ Deed of Contract, dated 15th February 1854.

Cons. 23rd Dec. 1853, Nos. 21 and 22.

In December 1853, the extension of the Railway, from the Raneegunge Station up to the actual site of the Raneegunge Coal Pits, was sanctioned by the Government of India. The construction of Electric Telegraphs for the Railways in India was also sanctioned in the same month.

Cons. 2nd Dec. 1853, Nos. 64 to 67.

The direction of the line from Burdwan to Allahabad having been previously approved, that from Allahabad to Cawnpore was sanctioned in June 1854; from Cawnpore to near Agra, in December 1854; and thence *vid* Agra and Muttra to Delhi, in November 1855. Surveys of two alternative lines to Lahore were executed in 1854-55, and additional Surveys, from Mirzapore and Allahabad to Jubbulpore, were completed during the last cold season, and are now under consideration. Surveys from Cawnpore to Bhilsa, and for the extension of the Raneegunge mineral branch, were authorized in 1855, but have not yet been executed.

Cons. 9th June 1854, Nos. 41 to 45.
Cons. 30th June 1845, Nos. 27 to 29.
Cons. 28th July 1854, Nos. 64 to 68.
Cons. 1st Dec. 1854, Nos. 45 to 50.
Cons. 14th Sept. 1855, Nos. 130 to 138.
Cons. 23rd Nov. 1855, Nos. 125 to 126.
Cons. 22nd June 1855, No. 33.

In September 1854, a proposition to shorten the line of Railway, in rounding the Hills near Monghyr, by tunnelling 1,000 feet through a jutting spur of rock, which was calculated to shorten the distance by two and a half miles, was approved, and in January 1855, the construction of a tunnel at Rajmehal, by which the line was shortened three and a half miles, was sanctioned.

Cons. 15th Sept. 1854, Nos. 65 and 66.
Cons. 26th Jan. 1855, Nos. 114 and 115.

From Howrah to Pundooah, thirty-seven and a half miles, the Railway was open for traffic on the 15th August. On the 7th April 1854, the rates for the conveyance of goods and passengers by the Railway were approved, and the General Rules and Regulations for the Railways in India were passed on the 18th August 1854. The official opening of the whole line to Raneegunge took place on the 3rd February 1855.

Cons. 7th April 1854, Nos. 71 to 74.
Cons. 18th Aug. 1854, Nos. 28 to 41.

A project for a brick bridge, to carry the Railway over the Soane, was sanctioned by the Government of India in January 1855, but the Railway Directors objected to this mode of construction, and obtained the consent of the Honorable Court* to the erection of an iron bridge.

Cons. 19th Jan. 1855, Nos. 119 to 123.

It is calculated, that the portion of the Railway, from Allahabad to Agra (except the Jumna Bridge at Allahabad) will be ready by the end of 1857, and arrangements are in progress for opening this portion of the line separately.

The section between Burdwan and Rajmehal was to have been completed in 1858, and the remainder probably not till 1859.

It having been represented† to the Honorable the Court of Directors, that much advantage would be derived, if an experienced Iron and Mineral Viewer were sent out to

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* Honorable Court's Despatch, No. 21 of 1855, dated 5th September.

† Financial (Railway) Letter from Court No. 13 of 1855, dated 16th May.—Ditto ditto, No. 19 of 1855, dated 8th August.

this country, Mr. D. Smith was appointed by them to the situation. The object of the appointment is two-fold—*first*, to ascertain the suitability of the coal found in India to Railway uses, either in its mineral state or in the shape of coke, and *secondly*, to solve the question as to the practicability and expediency of reducing the iron ore, found in various parts of Bengal, into a state fit for the purposes of manufacture.

Mr. Smith arrived in Bengal on the 16th October 1855, and his Report of the result of his operations during the past season has been received.

MADRAS RAILWAY COMPANY.

In March 1851, the Report of Colonel Pears, C. B., was submitted.

In 1852, the Madras Railway Company entered into a contract, with the Honorable East India Company, to construct an experimental line to Vaniembaddy.

A Survey was ordered from Madras, by Cuddapah to Bellary, to meet the Bombay line, and from Vaniembaddy, by Salem to Ponany, on the Malabar Coast.

Cons. 4th March 1853, No. 73.

The construction of the latter line was sanctioned* by the Honorable Court; beginning from both ends. The line from Vaniembaddy to Bangalore was also sanctioned.†

In 1855, the Madras Government proposed to dispense with the line from Madras *viâ* Cuddapah to Bellary, and to substitute for it, the connecting link from Bangalore to Bellary *viâ* Cuddapah towards the Coast.

Cons. 5th April 1855, Nos. 49 to 56.
Cons. 22nd June 1855, Nos. 28 to 31.

This proposal was not approved by the Supreme Government,‡ but the general question, regarding the direction of the line connecting Madras and Bellary, was referred to the Honorable Court, whose concurrence in the views of the Government of India has since been intimated.

GREAT INDIAN PENINSULA RAILWAY COMPANY.

In 1845, a line was surveyed from Bombay to Kallian, and up the Syhadree Range by the Malay Ghât, from the top of which it was to branch Northward and Southward.

In 1849, the Great Indian Peninsula Railway Company entered into a contract,§ with the Honorable East India Company, for the construction of an experimental line, 35 miles long, calculated to cost £500,000, to form part of a trunk line connecting Bombay with Kandeish and Berar, and generally with the other Presidencies of India.

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* Despatch from the Hon'ble Court to the Government of Fort St. George, No. 7 of 1853, dated 14th September.

† Letter to Fort St. George, dated 22nd June 1855, No. 713. Minutes by the Most Noble the Governor General, dated 8th May 1855.

‡ Letter to the Honorable Court, No. 10 of 1855, dated 22nd June.

§ Honorable Court's Financial Despatch to the Government of India, No. 27 of 1849, dated 14th November

In 1854, the surveys of the Bhore and Thull Ghâts were completed. In 1852, Colonel Kennedy submitted* his Memoir, objecting to the lines proposed by the Great Indian Peninsula Railway Company's Engineers.

The first section of the Bombay line was opened to traffic on the 16th April 1853.

During the season of 1853-54, Surveys were executed in prolongation of the Thull Ghât line to Jubbulpore, and in prolongation of the Bhore Ghât line to the Kistna.†

Cons. 15th Dec. 1854, Nos. 126 to 133. Letter to Court, No. 24 of 1854, of 22nd Dec.

On the 13th December 1854, the Government of India approved the Bhore Ghât line, and recommended to the Honorable Court that it should be adopted for the South-East trunk line to Madras.

Cons. 14th Sept. 1855, Nos. 126 to 128.

On the 14th September 1855, the Government of India approved‡ the Thull Ghât line, and recommended its adoption as a local line to Kandeish, and its extension to Julgaon. A Survey for an extension of this line due East to Nagpore was also sanctioned.

The result of this Survey was reported by the Government of Bombay on the 13th November 1855, and on the 21st December, the Government of India§ recommended that sanction should be accorded to the construction of the Eastern line from Kandeish to Berar and Nagpore.

The fourth section of the line was opened to traffic to Wasindree in October 1855.

The traffic on this length (51 miles) now amounts to about Rupees 4,000 per week.

The Honorable Court have now sanctioned the extension of this line, through the valley of the Nerbudda, to meet a line from the Ganges valley to Jubbulpore.

They have also sanctioned the branch line to Nagpore.

OPERATIONS OF THE BOMBAY, BARODA, AND CENTRAL INDIA RAILWAY COMPANY.

This Company was organized in 1852, and was permitted to survey lines from Bombay, *viâ* Surat, Baroda, and Neemuch, to Agra, also from Surat, by the valley of the Taptee, into Kandeish, with an extension into the valley of the Nerbudda. In the event of neither of these lines being conceded to the Company, the expenses of the Survey were to be repaid by the Company, to which the construction of the line might be entrusted. The result of the Surveys was reported by Colonel Kennedy in 1854.

Cons. 19th May 1854, Nos. 87 and 88.

Cons. 3rd Nov. 1854, Nos. 40 to 52.

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* Honorable Court's Financial Despatch to the Government of India, No. 51 of 1852, dated 22nd September. Memoir by Major J. P. Kennedy, dated 14th September 1852.

† Letter from the Government of Bombay to the Honorable Court, No. 10 G., dated 19th March 1855.—Report by Mr. J. J. Berkley, Chief Resident Engineer, Great Indian Peninsular Railway Company, dated 6th October 1854.—Minutes by the Right Honorable the Governor of Bombay, dated 24th February and 7th March 1855.—Minutes by the Honorable Mr. Lumsden, dated 6th and 8th March 1855.

‡ Letter from the Government of India to the Honorable Court, No. 16 of 1855, dated 14th September.

§ Letter to the Honorable Court, No. 29 of 1855, dated 21st December.

They were considered favorable as regards the Coast lines from Bombay to Baroda, but less so in respect to the Taptee valley line. The line from Baroda to Neemuch appeared so unfavorable, that an alternative line was proposed from Baroda, *viâ* Ahmedabad and Palee, to Delhi.

After consideration of this Report, the Government of India determined to recommend* to the Honorable Court, to concede to the Bombay, Baroda, and Central India Railway Company the construction of a Railway from Bombay to Ahmedabad, to await further information of the Thull Ghât line, before coming to any decision on that of the Taptee valley, and to require the Bombay, Baroda, and Central India Railway Company to prosecute further Surveys, in view to the connexion of their line with the North-Western Frontier of India.

Subsequently, on the receipt of full Reports on the Thull Ghât line, the Taptee valley line was rejected, and the Bombay, Baroda, and Central India Railway Company were instructed to survey a new line from Baroda, or Ahmedabad, to Agra, or Delhi, and from Broach, by the Tirella Ghât, to Agra.

Cons. 27th April 1855, Nos. 54 A. to 66 A.
Cons. 14th Sept. 1855, No. 127.

* These Surveys have since been completed under the directions of Sir R. N. C. Hamilton, and the results are now under the consideration of Government.

SCINDE RAILWAY COMPANY.

In December 1853, the Government of Bombay forwarded Reports from Lieutenant Chapman, who was deputed, in August 1852, to examine the ground between Kurrachee and the Indus, with a view to the forming of a constantly navigable Channel. The Reports embraced two projects, one for a Canal, from Jurruck to Kurrachee, and the other, for a Railway, from Kotree to Kurrachee. The Government of India sanctioned the entertainment of an Establishment to carry out the Surveys for the completion of these plans.

Cons. 13th Jan. 1854, Nos. 100 to 105.

In 1855, the Scinde Railway Company entered into an agreement with the East India Company, and the Honorable Court,† in February 1855, sanctioned the construction, by this Company, of a line from Kurrachee to some point on the Indus, to be decided by the Government of India, in communication with the Government of Bombay, and guaranteed interest, at the rate of 5 per cent. per annum, upon the Capital of £500,000 required for the execution of the line.

In May 1855, the appointment of a Deputy Superintending Engineer was sanctioned by the Bombay Government, and the Commissioner of Scinde, who was consulted on the subject, suggested that Jurruck should be the terminal point of the proposed line, and that the direction should be decided after the completion of the Surveys, for which Surveyors were on their way out from England.

* Minutes by the Most Noble the Governor General, dated 12th and 28th October 1854.—Letter to Court of Directors, No. 23 of 1854, dated 3rd November.

† Honorable Court's Despatch No. 2 of 1855, dated 21st February.

JOHN GRAY, "CALCUTTA GAZETTE" OFFICE.

REPORT

OF PROCEEDINGS

IN THE

PUBLIC WORKS DEPARTMENT

DURING THE OFFICIAL YEAR 1858-59.

IN the present, as in the past official year, the financial pressure on the Government has restricted nearly all expenditure to the maintenance of existing works and to the construction only of those which were most required for the shelter and comfort of European Troops, or for purposes of State administration; nor was it to be expected under such circumstances that projects of Internal Improvement involving large outlay would either be submitted to, or considered by, the Government of India.

FINANCIAL AND ACCOUNTS.

Classification of Expenditure and of Correspondence.

A COMMITTEE was appointed to report on the best method of simplifying the Statements of income and expenditure in the Department of Public Works.

Their Report suggested a new and systematic classification of Public Works expenditure to facilitate the preparation of the various Returns which are required by Government to exhibit the annual operations of the Department.

That system of classification has been adopted throughout the Department and at all the Presidencies in the accounts, correspondence and records.

Public Works Accounts.

The Government of India, having had under consideration the state of the P. W. Accounts, was convinced that it was necessary to make continuous efforts in order to place this important branch of the Administration on a satisfactory footing. The advantage of introducing uniformity of system in the Public Accounts is obvious, and in the case of the P. W. Accounts such uniformity is the more necessary as these Accounts are in their nature so complex and elaborate, that without assimilation they cannot be properly understood, checked, or amalgamated in the Offices of Account under the Government of India. A Committee has, therefore, been formed to consider the propriety of appointing an Officer to the special charge of these Accounts. The Committee will report their opinion to the Government of India with such proposals as they may think fit as to the nature of the duties that should be entrusted to such Officer, and the manner in which any change of system may be brought into operation so as to avoid confusion or difficulty.

The following is a Statement of the estimated expenditure on Public Works in India during the year 1858-59:—

General Statement of Probable Expenditure on Public Works and Railways under the Local Governments and Administrations subordinate to the Government of India for 1858-59.

Provinces.	Public Works Department.									Railway Department.	Total of Public Works and Railway.
	Works.							Establishments, Contingent and other Charges.	Total.	Establishment and Land.	
	Ordinary.			Extraordinary.			Grand Total.				
	Military.	All others.	Total.	Military.	All others.	Total.					
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Bengal	1,62,684	11,48,446	13,11,130	28,37,833	5,29,879	33,67,712	46,78,842	11,04,698	57,83,540	80,000	58,63,540
North-Western Provinces	2,87,700	9,18,200	12,05,900	54,59,900	26,72,600	81,32,500	93,38,400	15,29,200	1,08,67,600	4,15,000	1,12,82,600
Oudh	70,000	5,000	75,000	20,00,000	6,00,000	26,00,000	26,75,000	1,25,000	28,00,000	0	28,00,000
Punjab	3,02,800	2,44,484	5,47,284	22,03,391	16,73,328	38,76,719	44,24,003	8,47,387	52,71,390	0	52,71,390
Straits Settlements	39,384	20,783	60,167	7,72,292	88,627	8,60,919	9,21,086	29,315	9,50,401	0	9,50,401
Pegu	2,41,100	1,10,544	3,51,644	4,41,826	3,18,959	7,60,785	11,12,429	1,68,660	12,81,089	0	12,81,089
Tenasserim and Martaban	35,171	3,430	38,601	16,407	34,026	50,433	89,034	24,548	1,13,582	0	1,13,582
Madras	1,00,000	24,00,000	25,00,000	11,40,000	11,50,000	22,90,000	47,90,000	16,42,250	64,32,250	92,396	65,24,646
Bombay and Sindh	1,30,865	14,91,772	16,22,637	11,81,021	11,05,055	22,86,076	39,08,713	7,38,051	46,46,764	1,14,814	47,61,578
Mysore and Coorg	3,000	2,85,700	2,88,700	2,800	2,44,950	2,47,750	5,36,450	1,60,170	6,96,620	0	6,96,620
Hyderabad	8,000	35,000	43,000	60,000	1,16,000	1,76,000	2,19,000	61,250	2,80,250	0	2,80,250
Nagpoor	15,204	29,125	44,329	1,38,889	4,40,997	5,79,886	6,24,215	1,24,913	7,49,128		7,49,128
Grand Total	13,95,908	66,92,484	80,88,392	1,62,54,359	89,74,421	2,52,28,780	3,33,17,172	65,55,442	3,98,72,614	7,02,210	4,05,74,824

To prevent doubts, and to attain an uniformity of practice without which the Public Works Accounts of the various parts of the Empire are not comparable, the following instructions were issued relative to the adjustment of various charges. [*P. W. Dept.*]

Machinery and Plant.

All charges for the purchase of machinery to fall on the works for which it is required. The cost of the machinery to be covered by a percentage, or by a direct charge, asmay be most convenient. The Estimates for works passed by Government are supposed to cover the cost of plant, and the money to pay for machinery should come out of the sanctioned Estimate.

Local Governments and Administrations are competent to sanction the purchase of machinery for any special purpose up to the limit laid down in the Budget Rules for original works, although the charge is not immediately covered by sanctioned Estimates for work, but on the understanding, before explained, that the amount is eventually to be recovered by a charge for the use of the machinery in a bill covered by a sanctioned Estimate.

When machinery is required for any really permanent object, and is not in the nature of plant required for the construction of works on Estimate, its cost may be dealt with as any other expenditure on public works, and appear as a direct and final item of charge.

Work done for other Departments by P. W. Officers.
Stationery.

Accounts of such disbursements are to be submitted to the Chief Engineer, and are to be debited to the several Departments by the Central Office of Account.

Charges for stationery are to be similarly submitted for primary audit by the Chief Engineer, and for eventual submission by the Central Office of Account to the Superintendent of Stationery in a general bill for all items of stationery.

Engineer Park Stores purchased by Executive Engineers.

Engineer Park stores were, during the late campaign, occasionally supplied by Executive Engineers on the requisition of Officers Commanding Field Forces. Such charges had been erroneously passed as "Public Works Charges." They were, therefore, ordered, for the future, to be submitted for audit to the Military Auditor General, and to be written off in the Public Accounts to the head of Military.

Extraordinary Expenditure occasioned by the Mutinies.

A very large expenditure had to be incurred in this Dept. on public works, the necessity for which had arisen out of the late mutinies. The precise amount was not known, and as it was desirable that the Government of India should possess a record not only of the sums that had actually been expended up to a certain date, but of what was likely still to be incurred on this account, the local Governments which were affected by the disturbances were desired to submit Returns shewing the expenditure at the principal stations under the following heads :—

1st.—Defensive works.

2nd.—Temporary buildings for the accommodation of Troops.

3rd.—Additional permanent buildings for the same object.

4th.—Miscellaneous supplies and charges connected with troops, the disbursements for which had been made by P. W. Officers.

The Returns were ordered to be so sub-divided as to shew—

[*P. W. Dept.*] The expenditure actually incurred from 1st May 1857 to 31st December 1858.

The estimated expenditure from January to 30th April 1859.

The estimated expenditure for the Official year 1859-60.

Appendix B. The annexed Statement* compiled from the Returns received in compliance with this call, gives the required information under each head for each period. It may be condensed thus—

	Amount actually expended from 1st May 1857 to 31st December 1858.	Estimated expenditure from January 1859 to 30th April 1860.	TOTAL.
	Rs.	Rs.	Rs.
Madras...	1,50,715	3,59,232.	5,09,947
Bombay...	12,25,887	12,78,368	25,04,255
N. W. Provinces.. ...	99,37,793	60,49,652	1,59,87,445
Bengal...	23,54,610	10,75,213	34,29,823
Punjab...	4,11,664	17,09,360	21,21,024
Oudh...	9,95,135	64,62,312	74,57,447
Nagpoor...	1,10,943	39,664	1,50,609
Hyderabad...	4,215	3,040	7,255
Total... ...	1,51,90,994	1,69,76,841	3,21,67,805

DEPARTMENTAL MANAGEMENT AND DETAILS.

Banking System in the D. P. W. In order to obviate the necessity for maintaining small separate Treasuries by Executive Engineers, a system of banking in Collectors' Offices has been experimentally introduced. The change will not be rigidly insisted on where it is likely to cause great inconvenience in carrying on public works, as the success of the plan is mainly dependent on the facility with which cheques are paid at the Collectors' Treasuries.

Salaries of Officers whose Accounts are in arrears to be retrenched. It has been ruled that Executive Engineers, whose accounts are not received in the Central Office within three months of the close of the period to the transactions of which they refer, shall be subjected to a retrenchment of a moiety of their salary, the retrenchment to be final unless good and sufficient explanation be furnished to the Government of India.

Subordinates to be subjected to similar retrenchment if their accounts are in arrear more than two months. Chief Engineers have also been authorized to employ extra Clerks or Accountants to bring up arrears at the expense of the Executive Engineer during whose incumbency the arrears accumulated.

[P. W. Dept.]

Disbursements of money by P. W. Officers.

It has also been ruled that the payment by any Public Works Officer entrusted with public money of any travelling allowance, or salary of persons belonging permanently or temporarily to the regular P. W. Establishment prior to the audit of the bill, or without permission of superior authority, or the payment of any sum retrenched by proper authority, will be regarded as a criminal breach of trust and will render the person guilty of it liable to dismissal and to such other penalties as the case may authorize.

Supplies of Cash to subordinates.

It has been ordered that Sub-Engineers and other subordinates are not to be entrusted with the expenditure of sums of money out of proportion to their Stations and emoluments.

Keeping of Departmental Accounts.

All Departmental accounts are to be kept in the most open and public manner. Disbursements and charges of whatever sort connected with the public service are to be clearly brought forward in the public accounts and no irregular separate or local accounts or funds will be permitted to be kept. The confusion of private and public cash transactions has been ordered to be strictly guarded against.

Young Engineer Officers to be instructed in Accounts.

All young Engineer Officers on first arrival in India are to be instructed in Public Works Accounts in the Office of the Chief Engineer.

Committees to select sites for Cantonments, &c.

In order to ensure a sufficient knowledge of the locality it has been ordered that the Commissioner of the Division or the Deputy Commissioner of the District shall in future be placed on all Committees assembled for the purpose of selecting new sites for Cantonments, Forts, &c. Such Committees will be composed of two Military Officers, two Medical Officers, one Civil Officer or Military Officer in Civil employ, and the Executive Engineer will attend the Committees and render assistance.

Records of boundaries of Government Lands.

The following Rules have been laid down in order to remedy defects in the system of recording Cantonment boundary plans, and to ensure the maintenance of proper boundary marks and records of boundaries of all Government lands whether occupied for Military or Civil purposes.

The boundaries of all existing Cantonments to be revised, the recorded plans to be corrected where necessary, and permanent boundary pillars to be erected where they do not exist; where doubts exist as to the exact limits of the Cantonment, the necessary steps to be taken to settle the question without loss of time.

The registers of plans in the Offices of the Chief Engineer and of the Quarter Master General to be carefully kept up and revised. The drawings in every case to be on such a scale and in such detail as to furnish a complete and indisputable record of the land to which they refer.

The Chief Engineer of each Province to be called on to report as to the present state of this particular branch of the records in his own and in his Executive Engineer's Offices. He is to take the necessary steps to make good all deficiencies either in the plans or the boundary marks. Superintending Engineers to consider it a part of their duty in their inspection tours to examine these records in Executive Engineers' Offices, and to bring to notice any defects that may be apparent.

[*P. W. Dept.*] The general Rules as to the record of the boundaries of land occupied as Cantonments to be followed so far as they are applicable in the case of land occupied by public buildings or works of every sort not situated within a Military Cantonment.

In case of buildings and works directly under the charge of P. W. Officers the Executive Engineer to be held responsible that complete and accurate plans of all land, the property of Government, attached to such works or buildings are kept up in his Office, and that they are corrected from time to time as necessity may arise.

Copies of these plans to be lodged with the Chief Engineer and with the Collector of the District. One or more of the Executive Engineer's subordinates to be made responsible for the proper maintenance of the boundaries of all plots of Government land, and to be expected to know accurately the exact limits of all the Government lands connected with the Department of Public Works in each Executive Division.

When public buildings are not in charge of the P. W. D. the Officer in responsible charge is to maintain a proper plan and proper boundary marks, as laid down above. In this case copies of the plans to be lodged with the Collector of the District and with the Board of Revenue.

Committees not to be employed to investigate cases of accidents or loss.

The attention of the Local Administrations was drawn to the Rule that Committees should not be employed to investigate accidents or losses unless under special orders.

In such matters the action of Committees too often served only to set up a screen between public Officers who had been guilty of neglect, or worse offences, and their responsibilities.

It has, therefore, been ruled that in future Chief Engineers will, under the orders of the chief Civil Authority, institute such enquiries as are necessary to get at the facts, and that judgment will then be passed on the case.

Accidents.

Under recent orders Executive Engineers are required to report direct to the Government of India all important accidents to buildings or works that may occur in their respective charges whether from fire, wind, flood or other cause.

Roofing of Public Buildings.

With a view to reduce the risk of fire from accident or design, certain genetal principles (which will be found detailed in Appendix C) have been laid down in regard to the roofing of public buildings, and the construction of chimnies.

Photographers for the P. W. D.

The Chief Engineer, Bengal, having suggested the entertainment in the D. P. W. of qualified men from the Royal Sappers and Miners to take photographic representations of public works, he was desired to consider how far natives might be employed for the purpose. Some progress, it was understood, had been made in instructing natives in this art in the Industrial School, and it seemed probable that, by making use of that Institution, and by engaging one or more expert Europeans to superintend the native artists, the object in view might be realized at comparatively small expense.

A Sergeant of the Sappers, who had been employed while at Chatham in photography, is now employed in the D. P. W. to take photographic representations.

No rent is demanded by Government for the occupation by Officers or subordinates of Inspection Bungalows, but these Bungalows are not to be so occupied as to prevent proper accommodation being available for Officers or subordinates who are entitled to shelter in them. [*P. W. Dept.*]

Occupation of Inspection Bungalows.

Executive Officers and Assistants, when forwarding their applications for privilege leave will, for the future, be required to state that they have ascertained from the principal public Officers of other Departments in their Divisions that their absence is not likely to be attended with any inconvenience to the public service.

Privilege Leave to Executive Officers and Assistants.

It was ruled that Civil Engineers and Overseers appointed in England shall in all things be held to be placed under the ordinary Absentee Rules for Uncovenanted Servants, with the exception that the length of absence attained under Clause L., Section V., will, in their case, be limited to two years. Their admission to the advantages of furlough under the regular Uncovenanted Rules will depend on their relinquishing any claim which they otherwise might have under their engagement to a free return passage to England.

Civil Engineers and Overseers admitted to the benefit of the Uncovenanted Absentee and Furlough Rules.

STANDARD PLANS.

DURING the year under review Standard Plans of the following Civil and Military buildings were approved :—

CIVIL.

Standard Plan of a Deputy Commissioner's Cutcherry.

Standard Plans of Dâk Bungalows with Out-offices for 1st and 2nd class roads.

MILITARY.

Standard Plan of a Skittle Shed.

" of a Canteen for a Regiment of European Infantry.

" of a double Cook-room for two Companies of European Infantry.

" of Barracks for a Regiment of European Infantry on the plains.

WORKS.

As explained in previous Reports, it is not necessary here to give any details of the actual execution of works, as they will be found in the Reports of the Local Governments. The only points to be noticed are those of general moment, or those in which the Government of India was more directly concerned.

MILITARY.

THE subjoined Statement (Appendix A) shows the progress made in the construction of Barracks, &c., to the end of the official year under notice.

Orders were issued for the preparation of two Skittle Alleys for each Regiment at all Stations for European Troops where such provision for the amusement of the men did not already exist.

Skittle Alleys.

[*P. W. Dept.*] The conservancy of cantonments and large towns has engaged the serious attention of the Government, and rules (Appendix D) have been laid down in the endeavour to reform the irregularities which have hitherto existed.

Conservancy of large Towns and Cantonments.

ECCLESIASTICAL.

A QUESTION having arisen as to whether the orders of Government, which direct the repair at the public expense of Roman Catholic Chapels, used as places of worship for European Soldiers, and made over to the Government, applied also to the dwelling houses of the Priests, it was decided that such houses should be repaired when forming a part of the Chapel, but not when separate from that building, though in the same compound.

Repair at the public expense of Roman Catholic Chapels.

It has been decided that where money is granted by Government to aid in the erection of Chapels, when the Government grant preponderates, the building will be erected on a sanctioned design and estimate by the Executive Engineer; but when the private contributions equal or exceed the Government grant, the construction of the building may be entrusted to a Committee of which the Executive Engineer and the Commanding Officer of the station shall be ex-officio members.

Grants-in-aid for erection of Chapels.

The occupation of vestries of Churches as residences by Chaplains has been forbidden except under express permission from the local Administration.

Vestries.

EDUCATIONAL.

THE Government of Bengal was authorized to take the necessary steps for the early erection of the College at Berhampoor. The building, it was estimated, would cost Rs. 59,289, of which Rs. 29,000 were contributed by private individuals.

Berhampoor College Building.

Sanction was also accorded to the erection of a School House at Purneah at a cost of Rs. 5,452, of which Rs. 2,767 were contributed by the public.

School House at Purneah.

CHARITABLE INSTITUTIONS.

ON the requisition of the Principal, one of the lower wards of the Medical College Hospital in Calcutta has been fitted up as lavatories for patients, with boilers, pipes, &c., to lay on hot and cold water. This will afford the means of thoroughly cleansing all patients on their admission into Hospital and of maintaining constant personal cleanliness.

Lavatories in the Medical College Hospital.

ELECTRIC TELEGRAPH.

IT has been ordered that the principal buildings belonging to the Electric Telegraph Department shall be placed in charge of the Public Works Department to be repaired, &c., like any other Government buildings. The whole expenditure on the Electric Telegraph will in future form an item of Public Works charge.

INDUSTRIAL.

THE annexed Report (Appendix E) received from Mr. W. Sowerby, C. E., Superintendent of the Kumaon Iron Works, shows the result of the operations from the commencement of the works to the 30th of April 1859.

Iron Works in the Kumaon Bhabur.

The progress has not been so great as was anticipated owing principally to the late arrival of the necessary machinery, and the difficulty of procuring labourers. The great demand for and scarcity of labour had also increased the cost of the work. [*P. W. Dept.*]

DECHOUREE WORKS.

IT will be seen that the amount expended on the Works at Dechouree up to 30th April 1859 amounted to Rs. 62,528-18-8.

Of this amount—

Rs.	6,679	10	4	were expended on the erection of Blast Furnaces.
"	4,060	9	4	on Foundry, Fitting Shop and Forge Works.
"	12,646	1	1	on the Gool or Water Course.
"	5,314	12	5	on Roads and Bridges.
"	9,897	9	0	on Houses for European Workmen.
"	1,192	11	7	" Native "
"	18,851	3	2	manufacturing expenses.
"	3,887	4	9	repairs of old Works.

The average yield from Iron Stone was 41 per cent. nearly.

The total amount of Iron manufactured was 25½ tons at a cost of Rs. 54-15-8 per ton exclusive of European labour.

The balance shown in favour of the Works at Dechouree adopting the rates charged at Roorkee is ...	Rs.	6,475	14	8
During five weeks that the furnace worked, the manufacturing expenses including European labour amounted to	Rs.	3,292	1	9
And the value of Iron made	"	6,475	14	8
Showing a balance in favour of the Works of ...	Rs.	3,183	12	11

RAMGHUR WORKS.

THE total amount expended on the Ramghur Works to 30th April 1859 was Rs. 9,608-15. Of this amount—

Rs.	3,184	3	7	were expended on Forge Works.
"	1,353	1	1	on the Blast Furnace.
"	2,318	0	9	on Houses for Workmen.
"	93	8	0	on Roads.
"	2,650	5	7	manufacturing expenses.
"	9	12	0	on the Foundry.

The total amount of Iron manufactured was 5 tons.

The cost of manufacture	Rs.	1,706	5	11
Value of Iron manufactured	"	1,768	9	0
Showing a balance in favour of the Works of ...	Rs.	62	3	1

This Iron was manufactured by the common native process, a very expensive one when the labour has to be hired, and the manufacture was discontinued as soon as a quantity sufficient for the use of the Works was obtained.

Iron ore yielding 70 per cent. of Iron has been obtained from a Mine opened a little way from the Works.

[P. W. Dept.]

AGRICULTURAL.

Rajbuhas.

THE attention of the Government of India had for some time past been drawn to the mode in which assessments to cover the construction and maintenance of Rajbuhas were levied on the Canals in the North-Western Provinces.

According to the theory of that arrangement the Rajbuhas with their necessary masonry works, though constituting essential members of the distributary system, were the property of the villagers, and were paid for by them through an assessment.

The grounds and justice of these assessments were often ill understood by the people and led to considerable discontent.

It appeared desirable, therefore, that the system of assessment both in theory and practice should be changed, that the construction of Rajbuhas by tuccavee advances should cease, that the Rajbuhas should be considered simply as a part of the block of each Canal and their cost form an item in the Capital Account, and that the water rates should be re-adjusted so as to afford in one consolidated payment a fair and profitable return on the cost of all the Works including main Canal and Rajbuhas without distinctive treatment.

The Government of the North-Western Provinces has been directed to take measures for carrying out this change on all the Canals where Rajbuhas exist or are in contemplation.

The same principle has been extended to the Punjab as regards the Rajbuhas to be constructed in connection with the Baree Doab Canal.

DYKES.

Embankment of the Bhageruttee.

CERTAIN masonry ruins at Jaffergunge near Moorshedabad have been removed, and a line of sunken break-waters constructed to prevent the encroachment of the River Bhagiruttee on the city of Moorshedabad.

A large portion of the old embankments having been carried away, the completion of the new embankment at Chitpoor on the Bhageruttee was authorized in order to protect the country from inundation during the floods.

Damoodah floods.

A Report was received from the Government of Bengal showing the manner in which the measures determined upon in 1855 for the disposal of the surplus Damoodah floods had been carried out up to the end of the last working season.

Of the 20 miles of embankment on the right bank of the Damoodah ordered to be cleared away, 14 miles had been removed by the end of the working season of 1855-56, and one-and-a-half mile in 1856-57. The floods of 1856 were unusually heavy; but, in consequence of the removal of the 14 miles of embankment, they never rose in that part of the river higher than 16 feet; the height formerly having been 20 feet. The whole of the long reach of the river running east and west near Burdwan would seem, therefore, to have been brought under control, and the left bank saved from inundation. Below the bend, where the river turns south, the case was different.

The river there has not one-fourth of the capacity it has above; and the spill over the right bank was not sufficient to reduce the discharge to what the lower parts of the river can carry off. Some small breaches consequently occurred, and a very large one at a place called Sonaghur on the left bank, by which it was said that 80 square miles of country were laid under water.

No detailed Report of the flood of 1857 was received. It was evident, however, from the [*P. W. Dept.*] Report above referred to that this important subject required to be still further investigated, and that more extended information and enquiries were essential to a decision on the effects of what had already been done, and as to the steps yet to be taken.

It was, therefore, suggested to the Government of Bengal that the enquiries proposed to be made by that Government might be so extended as to constitute, in combination with the former valuable labours of other Officers, a complete and systematic investigation of the physical facts of the Engineering problem which had to be dealt with. It was evident that, until a perfectly clear apprehension was got of the objects to be attained, of the nature of the obstacles to be overcome, of what was possible and what impossible in dealing with the floods of a country like Bengal, nothing but disappointment would result. The object to be attained was so to deal with the river channels of Western Bengal as to secure the passage of the flood waters to the sea with the least possible injury to the general face of the country, and it was obvious that the very first step in order to accomplish this was to obtain a complete knowledge of the form of the region in which the operations were to be carried on. The investigation has been made for the country between the Roopnarain and Damoodah as far down as Amptah ; but it still remains to complete it. The extent of the inundations and the direction, the velocity, the depth, and the general destructive powers of the flood of waters depend directly on the levels of the surface, and, until these levels were accurately ascertained throughout the whole course of the floods, the Engineers would, in a great measure, be working in the dark.

Next to the obtaining of accurate levels what is wanted is a precise knowledge of the way in which the rivers behave in times of flood. To obtain this systematic records will be kept throughout the year at various places on the main lines of drainage, of the height of the water, and the direction and velocity of the current. The rain-fall at a sufficient number of points over the basin of drainage will also be noted.

When accurate information on these points has been obtained the Engineers will be able to go into any Engineering question which may arise regarding these rivers in a detailed and systematic manner.

Mahanuddee floods.

This important subject is now under the consideration of the Government of India. The Reports of several Engineer Officers have been submitted, and, amongst others, one from Colonel A. Cotton, of Madras Engineers, who was specially deputed to Cuttack for the purpose, as the question was closely allied to some of those which have been the subject of that Officer's attention and exertions in the public service for many years.

Meanwhile much has been done for the Province. The embankments are being repaired, new sluices have been constructed ; while the Cuttack revetment wall (the principal protective work of the Town) has been raised to an uniform level the whole way down the left bank of the Kutjoory River, and the stream which endangered the revetment has, by means of brush-wood break-waters, been diverted temporarily from the base of the wall. The embankments surrounding the City have also been raised and so constructed as to render it more secure in the event of an inundation.

River encroachments of Rampoor Bauleah Station.

The measures adopted for the protection of the Station of Rampoor Bauleah from the encroachments of the River Ganges were favourably reported on by the Government of Bengal.

The break-waters had been successful in diverting the deep channel of the river and preserving the bank from its erosive action. In some places as much as 14 feet silting up had taken place.

[*P. W. Dept.*] The completion of the continuous line of embankment, which protects the large and valuable area of land between the Huldee and Rusoolpoor Rivers, has been sanctioned, and expenditure authorized for making the protection uniform in places where it might be found to be defective.

Hidgellee Embankments.

Sanction was also accorded to the completion of the embankments of the Amersee Estate which protect the Pergunnahs of Hidgellee from the inland floods.

The submission of the results of the surveying and levelling operations now in progress are awaited by the Government of India before sanctioning the general progress of the embankments.

COMMUNICATIONS.

Owing to misapprehension in some instances of the scope of the orders restricting expenditure on public works, it was found necessary to intimate to the Local Governments that those orders were not intended to interfere with the execution of such repairs as were really necessary to prevent the deterioration of public works, and that all imperial lines of road which, at the time of the issue of those orders, were maintained at the public cost, should still be kept in thorough repair as usual, more especially the great lines of Post roads.

Repairs to Public Works.

District Roads.

The formation and maintenance of these roads have hitherto been entrusted almost entirely to the Road and Ferry Fund Committees.

Two distinct principles have, indeed, been repeatedly inculcated, viz :—*First*, that the Road Fund consisting of 1 per cent. on the land revenue shall be laid out so as to afford to the several villages paying the cess proportional facilities of access to the nearest markets ; and *Secondly*, that the surplus proceeds of ferries, after providing other ferries or bridges when required in the neighbourhood, shall be appropriated to the improvement of main roads of extended utility. But in the application of these principles the Committees are allowed large discretion, and delegate still larger discretion to their subordinates.

It not unfrequently happens that the Tehseeldars not only decide upon the sites of District bridges and the direction of District roads, but also design the works and superintend their execution ; and as these Officers do not commonly possess much knowledge of Engineering, their bridges and roads are occasionally both ill-placed and ill-made. Owing, besides, to the want of combination between different Committees, roads are allowed to terminate at the border of one District missing by a very short distance junction with roads in an adjoining District, which also terminate as uselessly a little way off on the same border, or two lines of roads in the same direction towards an important mart, being in two detached Districts, may be interrupted by an intermediate third District in which the connecting link has not been thought of.

It was evident, therefore, that however well adapted local Committees may be to dispose of local questions, it was hardly desirable that they should be entrusted with the design of lines of roads which should certainly be made on a review of the requirements of surrounding Districts as well as of those of the particular District to which any Committee belongs, nor was it expedient to place the works, bridges, culverts, &c., required for such lines of road under the control of Committees without competent professional advice whether as regards their design or construction. Executive Engineers, it is true, are directed to afford such advice to Committees as may be in their power, yet in practice it is not found that these Officers are able to give that aid which is essential to the full consideration of all works undertaken under the orders of these Committees.

On a consideration of these circumstances it has been suggested to the Local Governments [*P. W. Dept.*] whether something might not be done for the better management of this class of Works by appointing separate Divisional Road Engineers paid from the Local Funds who would exercise a general superintendence over the Works in the Divisions to which they are attached and act as professional referees in matters of doubt, and whose duty it would be to look after the designs of all works, and to co-ordinate the system of roads in the several Districts of which they have charge.

Bridges over the Tangra Nullah and its tributaries.

The construction of a wooden bridge over the Tangra Nullah and of two bridges over tributaries of the Tangra River near Shahpoor was sanctioned in order to open out a section of the 7th Division, Grand Trunk Road.

Pind Dadun Khan Bridge.

The bridge at Pind Dadun Khan, which is situated on a great thoroughfare for traffic between Upper India and the countries beyond the Indus, is to be maintained at the cost of the State, the income derived from it being credited to the general revenues.

Passage of the Indus at Attock.

Two schemes for the improvement of this passage were submitted by the Punjab Government: one for the application of steam to the improvement of the Ferry, the other for a Tunnel.

One of the river steam gun-boats lately sent out from England has been placed at the disposal of the local Government for the trial of the first proposal.

The project for a Tunnel was too expensive to be entertained under existing circumstances.

Roads in the Sonthal Pergunnahs.

Sanction was accorded to an outlay of Rs. 262,500 on the construction of roads in the Sonthal Pergunnahs. The work was originally undertaken with a view to give employment and food to the starving population.

Patna and Gya Branch Trunk Road.

The completion of the 1st section of this road from Dhobee to Gya has been sanctioned.

As regards the second section, it was ordered that the line should be completed to the town of Nair if it could be done at a moderate cost, or, at all events, that its connexion with some existing fair-weather track should be secured. The question of the extension of this section to Jehanabad was also ordered to be considered.

The 3rd section, or the line beyond Jehanabad, lies throughout across a country which, in the rains, is covered by one vast inundation flowing transversely across the proposed road. The passage of the large rivers also would involve a very heavy outlay, and numerous culverts and minor bridges at every part would be necessary to render the road capable of being maintained. This section will be maintained as a fair-weather road so long as there is no better communication.

With a view, however, to meet the requirements of Patna for communications to the north-west and south-east the following projects will be considered:—

1st. A line between Nair and Patna that shall run on the water-shed between the Fulgoo or Lilujan and the Moorhur or Dundha to within a few miles of the Ganges, thence turn to the west to Patna, and so cross all the drainage after it has collected below Patna, or, perhaps, even avoid a large part of it by striking into the road that follows the bank of the Ganges below Futtooah, leaving the main river to be crossed by ferries or boat bridges.

[*P. W. Dept.*] 2nd. A line of communication between Patna and the North-West which should run on the first main water-shed, between the Soane River and the minor rivers east of it. Such a road would go from Patna to Baroon on the Grand Trunk Road along the high ground on the right bank of the Soane without crossing any considerable body of drainage, and without involving any very expensive masonry works.

On receipt of a favourable Report from the Government of Bengal, and in consideration of the great importance of the G. T. Road, the completion of this work has been authorized.

Soane Causeway.

Darjeeling Road.

Orders were issued for the vigorous prosecution of the Darjeeling road, a work of great Military importance.

Agra and Bombay Road.

Orders have been issued to carry this road on to completion as quickly as the means of supervision will allow.

The deepening of the Circular Canal from the Chitpoor Lock to the Dhappa Docks at its entrance into the Salt Water Lakes has been sanctioned at a cost of about Rs. 1,22,000. The work was necessary, as deeply laden boats could pass through the Canal only at high water, and boats moored in it rested on the ground at low water, and were, consequently, liable to strain and break on the rising of the tides.

Calcutta Circular Canal.

The expenditure of about Rs. 25,000 was also authorized for the construction of towing paths, &c., along the eastern line of the Circular and Eastern Canals.

Sanction was accorded to the erection of a "Warren's Girder Bridge" over the new Cut for connecting the old and new Canals near the Dum-Dum Bridge. The iron-work received from England for the Kidderpoor Bridge will be used for the purpose.

Bridge over the new Cut to connect the old and new Canals near the Dum-Dum Bridge.

RAILWAY.

CONSIDERABLE confusion having arisen from the absence of correct registers and records of title of land taken up for Railway purposes, the attention of the Local Governments was drawn to the subject, and Rules laid down for observance generally with such modifications as local circumstances require. (See Appendix F.)

Rules for the record of land made over to Railway Companies.

The supervision of the Railways in Bengal, North-Western Provinces and the Punjab has been transferred to the Local Governments. Reference will be made to the Government of India only on questions of imperial moment.

Supervision of Railways transferred to Local Governments.

All efforts on the part of the E. I. Railway Company to effect the transport of Railway Permanent Way materials to the Upper Provinces through the agency of Contractors, &c., having failed, it has been arranged by the Company to transport their own stores in future, and with this view the construction of a suitable number of steamers, flats and sailing vessels has been ordered. The vessels will be built partly in this country and partly in England.

Formation of a Transport Fleet.

After inspection by the Consulting Engineer of the portion of the new Line between Howrah and Muggra, and the first portion of the Extension Line from the Junction to Beddia, 22 miles were opened for traffic in October 1858. Subsequently the extension from Beddia to Cynthea, 22 miles farther, was also opened.

Opening of the new Line of Railway between Howrah and Muggra, and of the first portion of the Extension Line, viz., from the Junction to Beddia.

Rajmehal Treasury.

A Treasury has been established at Rajmehal to meet the requirements of the East Indian Railway. [*P. W. Dept.*]

Accidents on Railways in India during 1857.

The annexed Report (Appendix G.) exhibits in a concise form the particulars of the accidents that have occurred on Indian Railways during the year 1857.

Progress of Railway Works in the Lower and Upper Provinces of Bengal.

Annexed are Reports (See Appendixes H., I.) of the progress of Works on the E. I. Railway in Bengal and the N. W. Provinces during the first half of 1859.

Traffic on the E. I. Railway.

Appended is a Statement (Appendix J.) of Traffic on the E. I. Railway for the Quarter ending 31st July 1859.

RAILWAY, N. W. P.

Fires in Railway Trains on the Line between Allahabad and Cawnpoor.

THESE fires were caused by the use of wood fuel consequent on the absence of coal. They have since been checked by the use of American chimnies and bafflers.

JUBBULPOOR RAILWAY.

The survey of this Line was deferred in consequence of the murder by a party of rebels of Mr. Evans, Chief Engineer, and Mr. Limnell, District Engineer of the Railway, whilst on survey duty at Entowah in the eastern border of the Banda District.

The facts of this lamentable occurrence are briefly as follows:—

The survey party under Mr. Evans left Allahabad on or about the 15th January 1859, and up to the 26th of the following month pursued their duties without risk or interruption. They were employed in detached survey parties, each accompanied by a guard, and at the time of the attack Mr. Evans and his party of Europeans would appear to have had with them a guard of 28 men.

The attack was made by a party of horsemen detached from a larger body, led by two men named Furzund Allee and Rummut Sing, who, under pressure from the force under General Whitlock, then at Nagode, were making their way across country.

On the morning of the 26th February they reached a village named Pendra and there learnt that a small party of European gentlemen had just arrived at Entowah. The Engineers were, it appears, warned by the Zemindars of the approach of the rebels some three or four hours before they arrived, but the warning was neglected, and before long the Railway encampment was attacked and Messrs. Evans and Limnell killed.

The survey operations will be resumed in the working season of 1859-60.

OUDH AND ROHILCUND RAILWAYS.

The survey operations in Oudh and Rohilcund will also be undertaken in 1859-60.

RAILWAY, PUNJAB.

Progress Report, Punjab Railway, for May 1859.

EARTH-WORK on the Lahore and Umritsur Line is very nearly completed, with exception of the two ends awaiting sanction of the Station sites; masonry works will commence after the rains.

[*P. W. Dept.*] On the Lahore and Mooltan Line the wells and bungalows will be ready for occupation by the cold weather. Meanwhile temporary accommodation is available to some extent at the Hurruppa Serai, the Chuchawutnee Dâk Bungalow, and at one or two other places on the Lahore and Mooltan Road.

Two-thirds of the whole number of sleepers for this Line have been contracted for, the second third to be delivered by 31st December 1861.

The preparation of Land Plans is proceeding satisfactorily, Drawings and Estimates of Station buildings and the working Estimates for the whole Line are in hand, and will be finished when the Line is sanctioned from end to end.

Transport of P. W. materials up the river proceeds satisfactorily, only four boats have been lost, and 174 have passed above Sukkur and overcome the most dangerous part of the navigation.

Boring works at the Sutlej near the Ferozepoor Ghat have been suspended in consequence of the rising of the river. The lowest depth attained was 22 feet, all through sand. Amount of earth-work done during the month is 32,334 cubic yards.

EASTERN BENGAL RAILWAY.

Proposal to alter the Line of the E. B. Railway.

A LARGE number of native inhabitants of Baraset, Nuddea and Jessore submitted a memorial praying that the direction of the Eastern Bengal Railway might be diverted from the selected route to that of the old Dacca road by way of Dum-Dum, Baraset and Gyghutta towards Bougung.

The memorialists were told that the subject of the route which the Eastern Bengal Railway should traverse had received full consideration from the Government of India, and that the natural difficulties of the Line proposed by them precluded its adoption and led to the choice of the one selected, which was the only Line practicable with reasonable economy in construction.

It was very gratifying to the Government to observe the increasing interest taken by the natives of India on the subject of Railway communication.

PROGRESS OF THE E. B. RAILWAY.

The Land Plans for the whole length, with exception of about five miles, were submitted and sanctioned up to June last. It was not possible to make over much of the land previous to the setting in of the rains, and consequently merely a commencement of earth-work on a few miles near Calcutta has been possible.

Up to the present time the land for 70 miles has been made over, including the Station site at Scalda, and the Contractor is making his arrangements for commencing operations throughout the whole of this length.

The abutments of the bridge over the first branch of the Circular Canal have been built.

The general plan of the Sealda Terminus has been submitted and sanctioned.

MUTLA RAILWAY.

No Land Plans were submitted till 3rd May 1859.

Up to the present time land, nearly 13 miles, has been transferred, and a commencement of earth-work has been made at several points, a supply of bricks has been procured from the Government brick-fields at Akra to commence masonry at Tolly's Nullah and some of the Stations, and a quantity of coal has been laid in for burning bricks.

The general nature of the arrangements for the Terminus at Sealda have been decided upon between the Government Officers and Chief Engineer, but a complete plan has not yet been submitted. The boundaries of land to be occupied have, however, been settled, and the land is now being taken up by the Contractor.

BOMBAY AND MADRAS RAILWAYS. [*P. W. Dept.*]

PARTICULARS regarding the Railways in the Bombay and Madras Presidencies will be found embodied in the Reports of the local Governments. It may here be briefly stated that of the G. I. P. Railway in Bombay 195 miles were open to Traffic at the end of June 1859. Of these 89 are in the Concan and 106 in the Deccan.

The gross receipts during the first half of the year 1859 were	Rs.	9,55,709
Maintenance and working expenses during the same period	"	4,26,452
Net Receipts	"	5,29,257

The expenses were, therefore, 44·6 per cent. of earnings.
The profits... ... ... 55·4 "

Of the Madras S. W. Railway 96 miles were open at the end of the first half of the year 1859.

The gross receipts during that period were	Rs.	2,59,459
The expenses	"	1,82,977
Net Receipts	"	76,482

The expenses, therefore, were 70½ per cent. of earnings.
The profits... ... ... 29½ "

APPENDIX A.

Abstract of Progress Reports of Barracks under construction in the Punjab, the N. W. Provinces, Oudh, Nagpoor and Bengal, for the month of April 1859.

STATIONS.	LINES.	REMARKS.
	PUNJAB.	
Attock.		
For 64 men	No. 1 Double Barrack ...	Completed.
" 32 " each ...	Nos. 2, 3 and 4 " ...	"
	" 5, 6 and 7 " ...	Masonry complete, will be entirely finished by end of May.
Kussowlee.		
For 250 men	No. 3 New Barrack	Walls about 10 feet high.
	" 4 "	Main walls about 4 feet high.
	" 5 "	Walls about 12 feet high.
	" 6 "	Walls of full height, except gables, trusses of roof, and flat roofing in progress.
	" 7 A Barrack	Main walls about 9 feet high.
	" 7 B "	" 10 " "
Subathoo.		
For 300 men	No. 11 New Barrack	Expected to be ready by end of May.
	" 12 "	" "
	" 13 "	" "
	Out-offices to "	" "
Dugshai.		
	Restoring roofs of verandas and replacing wooden posts by masonry arcades.	
	No. 1 Married Barrack ...	Masonry complete.
	" 2 " ...	"
	" 1 Men's " ...	More than half completed.
	Nos. 2 and 3 " ...	Completed.
	" 4 and 5 double ditto. ...	Commenced.
	No. 6 " ...	Not commenced.
	Nos. 7 to 10 " " ...	"
Meean Meer.		
For ½ a Regt. Eur. Cavy.	5 Barracks	Not commenced.
" a Regt. of Eur. Infy.	2 Skittle Alleys	"
	1 Ball Court...	"
	Butts for Rifle Practice ...	Gabions finished, earth-work in progress.
" 2 Cos. of Artillery.	2 Iron-framed Barracks ...	Foundations completed and plinth of main walls finished, 8 iron frames erected.
	8 Permanent Privies for Arty.	Completed.
	2 Wash-houses "	Masonry of No. 1 nearly completed, foundation and plinth of No. 2 completed.
	3 Temporary Wash-houses ...	Walls completed, roof in progress.
	2 Harness Rooms...	Not commenced.
	1 single Ball Court	"
Mooltan.		
For 6 Cos. of Eur. Infy.	6 Barracks	Five are occupied, the sixth it is expected will be ready for occupation in a few days.
" 1 Co. "	Iron Framed Barrack in the old Fort	⅔ of foundation and plinth built, and 35 iron frames erected.
" 1 Battery of Arty.	Iron-framed Barrack	Foundation and part of plinth built.
" a Regt. of Eur. Infy.	Hospital	Excavation done.
" 3 Cos. of "	Baracks 7, 8 and 9	Marked out, and foundation of one dug.

STATIONS.	LINES.	REMARKS.
Umritsur.		
For 3 Cos. of Eur. Infy.	3 Barracks in Cantonments...	2 finished, the 3rd being roofed.
" 2 " "	4 Barracks in Govindghur Fort.	2 finished, roofing of the other two half finished.
" a Light Field Battery.	Harness, store and grain rooms.	Walls 8 feet high.
Umballah.		
European Infy. Lines ...	Hospital	Tiled roofing ½ completed, flat roofing nearly completed.
	Fives Court	Completed to 22 feet above ground.
	Wash-house to No. 6 Barrack.	Completed, urinary stones wanted.
	Outer Verandas to Barracks.	
	No. 3	Floor incomplete.
	" 6	Step masonry half completed.
	" 7	Completed.
	" 8	Floor, step masonry and sand plaster and about ⅛ of roof to complete.
	Nos. 9 and 10	Floor, step masonry and sand plaster and whole roof to complete.
	No. 11	Floor, step masonry and sand plaster to complete.
	Guard-room	Foundation, step masonry and ⅓ superstructure completed.
	2 Skittle Alleys	Floor of 1 to complete, and roof and floor of the other.
	Dry Store Godown	Plinth, foundation and superstructure completed.
Cavy. " ...	2 Skittle Alleys	Roof and floor to complete.
	Qrs. for a Staff Sergeant ...	Walls to 4 feet pucka completed, kutcha-pucka superstructure about half completed and plinth and foundation completed.
	Out-houses for Hospital ...	Plinth and foundation completed.
Arty. " ...	1 Skittle Alley	⅓ roof and floor to complete.
	Dry Store Godown	Materials collecting.
	Magazine and Rear Guard ...	Just commenced.
	Enclosure Wall	Foundation excavated.
Ferozepoor.		
	No. 1 Barrack	Foundation, plinth and 8 feet of superstructure of one wing finished, iron trusses raised.
	" 2 "	Superstructure well advanced and rafters fixed.
	" 3 "	Foundation and plinth of wing finished, and 10 iron trusses raised.
	" 4 "	Foundation and plinth ready.
	Nos. 5 & 6 "	Not commenced.
	" 7 & 8 "	Marked out and foundation excavated.
Dera Ismail Khan.		
For 1 Co. of Eur. Infy.	2 Barracks in Akulghur Fort.	Plinth and foundation of No. 1 complete, the superstructure of lower story 1 foot high, No. 2 not commenced.
	Hospital	Will be finished by end of May.
	Ordnance Officer's house ...	Will be ready for occupation in a week.
	Magazine Sergeant's house ...	Foundation and plinth complete, superstructure commenced.
Rawul Pindee.		
For a Regt. of Eur. Infy. in the new Lines.	Barrack No. 1	Superstructure raised 9 feet all round.

STATIONS.	LINES.	REMARKS.
	Barrack No. 2	Foundation and plinth ready.
	" " 3	" completed.
	" " 4	Excavation of foundation completed.
	" " 5	Foundation marked out.
	" Nos. 6 to 10	Not commenced.
	6 Wells	Excavation completed in 1 and 20 feet in 2.
In the old Eur. Infy. Lines.	2 Skittle Alleys	Superstructure completed, wood and iron work for roof finished.
	Detached Comt. Store-room.	Foundation and plinth completed, superstructure raised 8 feet all round.
	Conjee House	Foundation and plinth completed.
For two Troops of Arty.	Barrack No. 1	Will be ready in one month.
	" " 2	Trusses for main roof fixed.
Native Lines	Addition and alterations to Hospitals and Gun-shed for accommodation of European Troops.	
	Left N. I. Hospital	Will be completed by end of one month.
	Temporary veranda	" "
	Right "	" "
	Artillery Gun-shed	" "
Murree.		
For Convalescents ...	Alteration to Barracks Nos. 9 and 10 to accommodate 64 men.	Both Barracks gutted, centre partition walls built up to roof.
	6 Married Barracks for 4 families each.	
	Nos. 14 and 15	Foundations finished.
	No. 16	Foundation commenced.
	" 17	Stone for superstructure ¾ dressed.
	Nos. 18 and 19	Not commenced.
	Restoration of permanent Hospital destroyed by fire ...	Will be completed by end of one month.
Jhelum.		
Native Lines	Addition and alteration to Native Line buildings for accommodation of European Troops.	
	Right N. I. Hospital veranda.	Will be completed by end of one month.
	Left " " ...	" "
	Arty. " " ...	" "
	Gun-shed	" "
Phillour.		
	Barrack Guard-room	Old works dismantled and foundation pucka masonry completed, ready to place the iron standards.
Bhagsoo.		
	Hospital, Dead-house, Cook-house and Privy	Completed except the interior white-washing.
	Medical Officers' Quarters and Out-offices	Very nearly finished, will be entirely so by end of one month.
	Subalterns' Quarters and Out-offices	Roofing in progress, out-offices about ⅓ finished.
For 107 men	Barrack at Kote Kangra ...	Almost ready for roofing.
	Temporary Barrack at Kote Kangra	Foundation built.

Stations.	Lines.	Remarks.
	N. W. PROVINCES.	
Shajehanpoor.		
For a Regt. of Eur. Infy.	Half-Company Barracks.	
	No. 1	Superstructure ready for trusses.
	" 2	No work done.
	" 3	Veranda arches all turned.
	" 4	" ¾ "
	Nos. 5 and 6	" ½ "
	" 7 and 8	Superstructure raised 8 feet.
	Barracks for Artillery	Commenced on 16th April.
	Hospital	Foundations complete.
Meerut.		
	A new Female Hospital for the Artillery Division	Complete with exception of punkas and painting to doors.
	Staff Sergeant's Bungalow for School Master	Complete with exception of doors.
Roorkee.		
	Temporary Buildings.	
For a Regt. of Eur. Infy.	Canteen...	Masonry and roof of main ward finished.
	Conjee House	Foundation and plinth finished.
Sapper Buildings ...	2 Wash-houses	Masonry, roof and floor finished.
	Pontoon Sheds	Completed.
Nynee Tal.		
For a Regt. of Eur. Infy.	Barracks Nos. 1 to 21... ...	Complete and partly occupied.
	Qurater Guard	Complete.
	Skittle Shed	"
	Overseer's Bungalow	"
Bareilly.		
	Half-Company Barracks.	
	Nos. 1, 2, 3, 4 and 5	Main walls to heights varying from 23 to 8 feet, veranda walls of Nos. 1, 2 and 3 to full height, of Nos. 4 and 5 to 5¾ feet.
	No. 6	Foundation masonry in progress.
	Fire Engine Shed...	Completed.
	Guard House in Fort	Built up to 10 feet above plinth.
Futtyghur.		
	Half-Company Barracks.	
For Eur. Infy. Regt. ...	Nos. 1 to 6 and 10 to 17 ...	Brick-on-edge flooring remains.
	" 7 and 9	Flooring half ready.
	" 8	Completed.
	Nos. 1 and 2 in the Fort ...	Brick-on-edge flooring remains.
	Out-offices	The Cook-houses and Privies are completed, the Wash-houses are in progress.
	Repairs and additions to the present Hospital	Pillars commenced.
	Powder Magazine	Site marked out.
Moradabad.		
	Cutcherry Buildings.	
	Nos. 1, 2, 3, 4 and 5	Materials collected to tile verandas.
	Sergeants' Mess	" "
	Plunge Bath...	Masonry and wood-work completed.
	Magazine	In progress.
For 1 Co. of Eur. Infy.	Building (detached) No. 2...	"
	Hospital	In good order.

Stations.	Lines.	Remarks.
Jhansi.		
	Half-Company Barracks.	
For a Wing of Eur. Infy.	Nos. 1 to 10...	Walls of 1 complete and trusses half on, of 2 the superstructures are 8 feet high, foundations and plinths of 3 others completed, and the foundations of the other 4 dug out.
For 3 Cos. of Infy. ...	Jhansi Palace	Finished and occupied.
" 2 "	Native buildings in Fort ...	Occupied.
	Building in Star Fort	"
	Cutcherry Barracks	Suspended.
For a Co. of Arty... ...	Residency buildings	Occupied.
" 2 Troops of Cavy...	Serai Barrack	"
" 1 " ...	Late Sudder Ameen's House.	Timber framing complete, bamboo framing partly on.
	Officers' Quarters.	
	Cavalry...	Finished and occupied.
	Infantry	1 Captain's quarters finished.
	Artillery	Partially suspended.
	Native Infantry	Suspended.
	" Cavalry	4 Subalterns' quarters nearly finished.
For a Regt. of N. I. ...	Lines	Lines for 2nd Company in progress.
" N. Cavy.	"	Commenced.
		N. B.—The works have been greatly delayed by the scarcity of work-people.
Lullutpoor.		
For 2 Cos. of Eur. Infy.	Nos. 1 to 4	Wall of one 11 feet high, the others not commenced for want of masons.
	Temporary Shelter.	
	17 Chuppers over Tents ...	Thatched roofs of all completed and put up, and the walls of six.
	1 Chupper for Quarter Guard.	Roof put up.
Ooraie.		
For a Wing of Eur. Infy.	Barrack No. 1	Completed with exception to laying on of tiles on the verandas and white-washing.
	" 2	Superstructure complete.
	" 3	" to height of spring of arches over door-ways.
	" 4	Exterior foundation and plinth complete.
	" 5	Not commenced.
	Temporary Hospitals.	
For 46 patients each ...	No. 1	Masonry and timber of roof complete.
	" 2	Exterior foundation completed.
	Medl. Subdts.' Quarters ...	Superstructure to 6 feet high.
	Quarter Guard with Cells ...	Not commenced.
Banda.		
	Repairs to Eur. Hospital ...	Nearly completed.
	Guard Room...	Complete.
	Veranda to main building ...	Nearly finished.

Stations.	Lines.	Remarks.
	Veranda to centre Barrack ...	One portion complete, another half finished.
	Qrs. for 4 Staff Sergeants ...	Foundations dug.
	Guard Room for Horse Battery.	Complete.
	Chupper over pucka roofs ...	2 complete, 3rd nearly so.
Humeerpoor.		
	Barrack	Superstructure 3 feet high.
	Hospital	" "
	Veranda to Serai occupied by Native Troops	Complete.
	Chupper to Barrack	One-half complete.
	Shed for Native Gun Lascars.	Timber-work almost finished.
Azimghur.		
For 2 Cos. Eur. Infy. ...	Barrack No. 1	Will be completed in one month.
	" 2	Superstructure half done.
	Hospital No. 1	Filling up plinth in progress.
	" 2	Not commenced.
	Staff Sergeant's Bungalow ...	Foundation, plinth, superstructure, roof and pucka plaster ready.
	Quarter Guard	Foundation excavated.
	Canteen	Not commenced.
	Hut for married men	Side posts fixed, centre pillars in progress.
Jounpoor.		
For 2 Cos. of Eur Infy.	Barrack No. 1	Superstructure nearly completed.
	" " 2	Foundation ¼ done.
	Hospital	Superstructure ½ finished.
	Quarter Guard	Not commenced.
	Canteen and Staff Barracks ...	Foundations ready for brick-work.
Goruckpoor.		
For half a Regt. of Eur. Infy...	Barracks Nos. 1, 2 and 3 ...	Will be completed on 5th May.
	" 4, 5 and 6 ...	" by end of May.
	Staff Sergeant's Quarters ...	Bullahs of wall and roof fixed of only one of the quarters.
For ½ Battery of R. Arty...	Barrack...	Filling earth to plinth and bamboo frame finished.
	European Hospital	Walling work completed.
	Sergeant Major's Quarters ...	Repairs to interior walls finished.
	European Sergeants' Mess ...	Walls and half of the veranda plinth finished.
Bustee.		
For ½ Wing of Eur. Regt...	Barracks Nos. 1 to 8	Complete.
	" 9 to 11	In progress.
For ½ Battery of R. Arty....	Naval Brigade Lines	Finished, with exception of matting, cleaning, &c.
For ½ Wing of Seikh Regt.	Yeomanry Cavalry Lines ...	Not commenced.
For Jât Irr. Horse ...	Madras Light Cavalry " ...	".
	Officers' Quarters (Infantry).	Completed.

Stations.	Lines.	Remarks.
Cawpoor.		
	Echellon Barracks.	
	No. 8	1st story beams in preparation.
	" 9	Finished to upper openings.
	" 10	Foundation finished.
	Bhoosah Godown	Finished.
	Malt Liquor Shed	Foundation of ½ of pillars laid.
	Dragoon Barracks (new roof).	½ a range stripped.
Allahabad.		
	Kuttra or Hospital Barracks.	
	Nos. 1 and 2...	Complete.
	" 3	Only tiling remains.
	" 4	Repairs of grass in progress.
	Main Guard	Intermediate rafters being inserted.
	Officers' Quarters	Complete.
	Skittle Alleys (2) converted into Hospital Stores and Dispensaries	Will be completed in one month.
	Dead House	Superstructure in progress.
	Mansfield or Kuttra Barracks.	
For a Regt. of Eur. Infy.	Nos. 1 to 10	Nos. 1 to 5 having extra rafters inserted and an additional 3" of grass, Nos. 6 to 9 are complete, No. 10 requires some flagging.
	Main Guard	Complete.
	Canteen, Orderly Room, School and Sergeants' Mess	Foundations excavated.
	Officers' Range.	
	Nos. 1 and 2...	Cross-walls removed and roof being renewed.
	No. 3	Foundation and plinth constructed.
	Solitary Cells	Roof repaired, alterations required to doors.
1 Co. Royal Arty., Convalescent Depôt and General Depôt Hospital	Chatham or General Hospital Lines.	
	Nos. 1 to 10	Petty repairs executed to Barracks with exception of Nos. 5 and 10 and Main Guard and Canteen, which have been new roofed.
	Main Guard, Canteen ...	
	Skittle Alleys (2)	Complete.
For 1 Troop Horse Arty.	Dead House	"
	Nos. 1 and 2 Barracks... ...	Cross-walls built in one for Married Quarters both flagged and plastered.
	Wellington or Papamow Lines.	
For a Regt. of Eur. Cavy.	Nos. 1 to 8	A small quantity of tiling remains to be done in Nos. 1 and 2.
	Married Quarters No. 1 ...	Roof in progress.
	" " 2 ...	Superstructure in progress.
	Riding Master's Quarters ...	" "
	Hospital	Roofing in progress.
	Cells	Foundation in progress.
	Canteen...	Not commenced.
	Orderly Room, School and Sergeants' Mess	"

Stations.	Lines.	Remarks.
	Clydesdale or Sumdabad Lines.	
For a Regt. of Eur. Infy.	Barracks Nos. 1 to 6 & 8 & 9.	Complete.
	" No. 10	Roofing and flooring in progress.
	" " 11	Converted into Officers' quarters.
	Barrack No. 7 and Officers' Quarters	Complete excepting doors.
	No. 2 Officers' Quarters ...	Foundation in progress.
	Canteen	Complete.
	Main Guard...	"
	Orderly Room, Sergeants' Mess and Schools	Superstructure nearly complete.
Ghazeepoor.		
	Temporary Canteen	Roofing completed.
	Temporary Married Men's Quarters (2)	Walls all up. Foundation and plinth of No. 2 completed.
	Temporary Hospitals (2) ...	Trusses and battens of 1 Hospital fixed, walls of 2nd all up.
	Solitary Cells	Foundations completed.
	Temporary Staff Sergeant's Quarters (2)	Foundations dug.
	Sergeants' Mess and School Room	Foundations marked out.
	Main Guard	Not commenced
Benares.		
For 33 men each	2 additional Temporary Hospitals	Plinth completed.
	[Sagor and Nerbudda Territories.]	
Jubbulpoor.		
For a Regt of Eur. Infy.	10 Single Men's Barracks ...	Nos. 2, 3 and 4 are complete, the rest require doors to complete.
	6 Married Men's Barracks ...	Doors wanting.
	Out-offices	Some are complete, the cook-rooms require doors to complete, some of the wash-houses are in the same state, and six of the privies want seats to complete.
	Canteen	Complete.
	Main Guard	Doors and windows wanting.
	Skittle Alley...	Roofing in progress.
	Conjee House	Not yet commenced.
	Hospital	Superstructure about 8 feet high.
Nagode.		
For 3 Cos. of Eur. Infy.	Barrack No. 1	Superstructure 6 feet in 3 rooms.
	" 2	Excavation of foundation commenced.
	" 3	Thatching partially completed, plastering in progress.
	Genl. Hospital of Nagode ...	Thatching ¼ finished, plastering in progress.
	Comst. Godowns and Sergt.'s Quarters	No. 1 shed and Sergeant's quarters complete, 2nd shed under repair.
	Quarter and Rear Guards ...	Will be complete in one month.

STATIONS.	LINES.	REMARKS.
Sagor.		
For 3 Cos. Eur. Infy. ...	3 Barracks	Nos. 1 and 2 complete, roofing of No. 3 in progress.
" 1 Co. Eur. Cavy. ...	1 Temporary Barrack	Finished.
" 1 " Madras Arty.	1 "	"
Nowgong.		
For 3 Cos. of Eur. Infy...	3 Barracks	Want verandas to complete.
	Quarter Guard	Requires tiles to complete.
	Hospital	Half the thatching of veranda required to complete.
	Medl. Subordinates' Quarters	Requires repairs to roof.
For a Batty. of H. Arty.	2 Barracks	1 requires verandas to complete, the other requires tiling, ventilators in roof, partitions and veranda to complete.
For Cavalry...	Barrack occupied by Madras Cavalry	Completed.
	GWALIOR.	
Gwalior.		
For 200 Arty. & Engrs.	Engrs.' & Arty. new Barrack.	Seven rooms occupied, the superstructure is complete.
" " Eur. Infy ...	2 old Bullock Sheds	Superstructure completed No. 1, and 5 rooms of No. 2 occupied.
" 100 "	New Barrack...	½ superstructure completed.
" " " each ...	2 new ½ Pendalls	¼ superstructure built.
" 150 " " ...	3 old Pendalls	Nos. 1 and 2 with 4 rooms of No. 3 occupied.
" 80 Dragoons " ...	3 "	Nos. 1 and 2 occupied, No. 3 lengthened out to full extent.
	OFFICERS' BARRACKS.	
	Infantry (for 8 Officers) ...	Superstructure of 6 sets of quarters completed, roofing partly finished.
	Dragoon (" ") ...	Superstructure completed and partly roofed.
	Mahratta Infy. Levy (4 Officers)...	Plinth and foundation completed.
	20 Bungalows (40 Officers each)	16 completed, doors and windows excepted.
Fort of Gwalior.		
	HALF-COMPANY BARRACKS.	
For Eur. Infy.	No. 1	Superstructure complete, thatching commenced.
	" 2	Walls raised 12 feet.
	" 3	" 4½ "
	" 4	" ½ foot.
	Nos. 5 and 6...	Foundation and plinth completed.
Goonah.		
	18 Platforms for Chuppers ...	Finished.
For 24 Men	18 Chuppers for 3 double pole Tents	8 finished, 9th nearly so.
	12 Temporary Half-Company Barracks	Foundations of Nos. 1 and 2 nearly finished, and excavation for foundation of No. 3 ready.
	Chuppers for Officers' Tents...	Finished.

Stations.	Lines.	Remarks.
	Cellar for Porter Casks	Finished.
	Bungalow to be re-roofed for Eur. Hospital	In progress.
	Ditto for Officers' Quarters ...	"
	Chuppers for Officers' Tents ...	Finished.
	Platform for Shed for Commissariat Stores	"
	Shed for the above	In hand.
Seepree.		
For 100 Eur. Infy. ...	2 Barracks	Superstructure of 1 commenced, platform of the other filled in.
	Guard Room	Will be ready with the Barracks.
	Hospital	Roofing of one side-ward remains.
For 100 Eur. Arty. ...	Old Gun Shed	" ½ finished.
	Staff Sergeants' Bungalows (3) for Officers' Quarters ...	Completed.
	Temporary shelter for Infy...	Roofing ½ finished.
	OUDH.	
Dilkoosha.		
	Half-Company Barracks.	
For a Regt. of Eur. Infy.	Nos. 1 and 7	Foundations, plinths complete.
	" 2 and 6	Trusses fixed.
	No. 3	Superstructure ¾ completed.
	" 4	Thatching completed.
	" 5	Superstructure ½ completed.
	Nos. 8 and 10	" nearly "
	No. 9	Ready for trusses.
	Nos. 11 to 20, and Married Barracks 1 to 8...	Not commenced.
	Hospitals (2)	Superstructure commenced.
	Half-Company Barracks.	
For a Regt. of Eur. Infy.	No. 1	Trusses being fixed.
	Nos. 2 and 10	Foundations and plinths completed.
	No 3	Trusses fixed.
	" 4	Ready for trusses.
	Nos. 5, 7 and 8	Superstructure ½ completed.
	" 6 and 9	" commenced.
	" 11 and 20, and Married Barracks 1 to 8...	Not commenced.
	Half-Company Barracks.	
For ½ a Regt. of Eur. Infy.	No. 1	Superstructure ½ completed.
	Nos. 2 and 3	" commenced.
	No. 4	Plinth and foundation completed.
	Nos. 5 to 10, and Married Barracks 1 to 4...	Not commenced.
	Barracks for 1 Troop each.	
For a Regt. of Eur. Cavy.	Nos. 1 and 2	Superstructure finished up to roofing.
	" 3 and 4	Trusses being fixed.
	No. 5	Foundation and plinth completed.
	Nos. 6 to 10	Superstructure raised to an average height of 10 feet.
	Married Barracks 1 to 6 ...	Not commenced.
	Hospitals (2)	Foundations and plinths ¾ completed.
For Artillery	Barrack No. 1	Superstructure completed up to roofing.
	" " 2	" to an average height of 20 feet.
	" Nos. 3 and 4 ...	Foundations dug.
	" No. 5	Foundation and plinth nearly completed.

Stations.	Lines.	Remarks.
	Barrack No. 6	Foundation and plinth finished.
	" Nos. 7 and 8 & Married Barracks Nos. 1 to 4.	Not commenced.
	Hospital No. 1	Foundation and plinth ¾ finished.
	" " 2	" ½ "
Gondah.		
For a Regt. of Eur. Infy.	20 Half-Company Barracks ...	No. 1 tiling and plastering in progress, No. 2 masonry complete, No. 3 masonry 14 ft. above plinth, Nos. 4 and 5 foundation in, No. 6 foundations and about ⅔ plinth complete.
	Married Barrack for 20 men.	Chowkuts all in and masonry uniform to 9 feet above plinth.
	Huts for Eur. Infy. & Troop of Eur. Arty.	*Infantry.* 4 huts for 25 men, 60 huts for 10 men each, and 1 hut for 20 men each complete, 10 huts in progress. *Artillery.* Huts for 100 men and 3 huts for Overseers complete.
Fyzabad.		
	Half-Company Barracks.	
For a Regt. of Eur. Infy.	No. 1	Walls full height.
	Nos. 2 to 10	" 14 feet high.
	" 11 to 20	Foundations complete.
	Married Barrack No. 1 ...	Walls 12 feet high.
	" " 2 ..	" 7½ "
	Hospital	" 18 "
For a Battery of Arty.	2 Single Men's Barracks ...	Foundations and plinths nearly complete.
	1 Married " ...	
" Wing of Eur. Regt.	Huts	Men's huts finished, Hospital huts nearly so.
" Regt. "	"	Roofs of 24 finished and frame-work of 18 more in progress.
" Co. of Engineers.	Temporary Huts	5 complete and 5 nearly so.
" Battery of Arty.	"	Frame-work of 16 ready, walls and roof under construction.
Seetapoor.		N. B.—The whole of the huts are expected to be completed by the end of May.
	Half-Company Barracks.	
For a Regt. of Eur. Infy.	No. 1	Wood of roof being fitted.
	" 2	Superstructure 14 feet.
	" 3	" 3½ "
	" 4	Plinth completed.
	Nos. 5 and 6	Brick-work of foundations in progress.
	" 7 to 20...	Foundations excavated.
	Married Barracks Nos. 1 to 6	Not commenced.
	Huts to hold 10 Men.	
For Troops, R. H. Arty.	20 Huts	Completed.
" Heavy Batty. B. A.	8 "	"
" Regt. of Eur. Infy.	72 "	57 completed.
	Huts for Staff Sergeants, N. I. Regiment (2)	Completed.
	Hospital Huts, N. I. Regt.	"

Stations.	Lines.	Remarks.
Sultanpoor.	Half-Company Barracks.	
For a Wing of Eur. Infy.	No. 1	Foundation nearly complete.
	" 2	Superstructure 11 feet high.
	" 3	Complete to top of plinth.
	" 4	Foundation half done.
	Nos. 5 to 10...	Not commenced.
	Huts to hold 12 men each ...	8 completed, 8 nearly done, 8 roofing, and 22 ready for roof.
	5 Hospital Huts	Completed.
Roy Bareilly.		
For a Regt. of Eur. Infy.	1 Large Hospital...	Main wards 9 feet high, verandas 5 feet high.
	60 Huts	13 completed with exception of plaster and white-washing, 6 more ready for thatching, 31 ditto masonry completed, 3 6 feet above foundations, 4 foundations in, 3 not commenced.
	1 Temporary Hospital for 40 Patients	Ready for roofing.
For a Batty. R. Arty. ...	10 Sheds or Huts...	2 ready for occupation, 6 ready for thatching, 1 ready for roofing, 1 not commenced. N. B.—The Permanent Barracks have not been commenced.
Barraitch.		
For 2nd Battn. Rifle Brigade and 3rd Troop 1st Brigade H. A.	Temporary Huts	Just commenced; it is expected they will be completed by end of May.
Kamptee.	**NAGPOOR.**	
For F. Arty. & H. Batty.	Staff Sergeants' Quarters ...	Completed, except verandas.
	Temporary Gun-shed	Completed.
" European Infantry...	2nd Skittle Alley	Roof forwarded.
	Qrs. for 4 Apothecaries ...	Nearly completed.
	2 Staff Sergeants' Quarters...	Completed.
	Bake House	Superstructure of pillars completed, side-posts, roof under construction.
Chindwarra.		
For Detachment 58 European Soldiers... ...	Temporary Barrack	Complete, except doors.
For Detachment 210 N. I. and 50 Irr. Horse.	" Lines...	Complete.
Raepoor.		
For a Regiment of N. I.	1 Quarter Guard	Completed.
	5 Bells of Arms, Right Wing,	Wood-work of roof being put on.
	5 " Left Wing.	Stone flooring and some plastering only remain to finish.
		N. B.—Intimated that no more reports need be submitted.
Dinapoor.	**BENGAL.**	
	Arty. Married Men's Barrack and Canteen	Complete.
	Hospital No. 1	Plinth completed and nearly filled in, superstructure of pillars ⅓ done, intermediate superstructure to 2½ feet.
	" " 2.	Foundation trenches ⅔ dug.

STATIONS.	LINES.	REMARKS.
	4 Skittle Sheds	Superstructure complete, trusses all on, and roof covering in.
	4 Main Guard Cells	Foundation trenches excavated.
Berhampoor.	LOWER-ROOMED BARRACKS.	
	Nos. 1 and 2	Foundations and plinths down of north and south verandas, internal alterations all completed.
	" 3 and 4	Internal alterations all completed.
	Sergeant's Mess, Orderly Room and Library	Superstructure 5½ feet above plinth and plinth nearly filled in with sand.
	Additions and alterations to old Main Guard to render it available as a Canteen ...	Work nearly done.
	Barrack Cells, Covered Way, Non-Commissioned Officers' and Private Guard Houses with Provost Sergeant's Qrs.	Superstructure of Cells 4 feet high and piers of verandas 6 feet high, superstructure of the two Guard Houses, Provost Sergeant's Quarters and Out-offices to full height of verandas.
	Skittle Shed, Left Wing ...	Roof being laid on.
	" Right " ...	Piers and gable ends nearly ready.
	Regimental Store Room ...	Foundation trenches dug.
Dehree.	HALF-COMPANY BARRACKS.	
For a Regt. of Eur. Infy.	Nos. 1 to 4 and 9 to 12 ...	Foundations excavated.
	No. 5	Iron frames up, plinth ¾ built.
	" 6	" complete, ½ superstructure 8 feet high.
	Nos. 7, 8, 14, 15, 17 and 18 ...	Ready for iron.
	No. 13	Five frames up.
	" 16	Iron frames up.
	Nos. 19 and 20	Foundations built.
Hazareebagh.		
For a Regt. of Eur. Infy.	Barrack No. 12 for Married Men	Completed all but tiling floor and plastering.
	Nos. 13 and 14 for Single Men.	Completed.
	No. 15 for Married Men ...	"
	Officers' Quarters	Roof framing completed.
	Main Guard	Superstructure nearly completed.
	Hospital No. 2	Roofing in progress.
	Skittle Alley No. 2	Foundation and plinth completed.
Dorunda.		
For 3 Cos. of Eur. Infy.	Barrack No. 1	Superstructure ¾ done.
	" " 2	Foundations done, putting up frames in progress.
	" " 3	Fundations done, damage done by storm of 26th April 1859.

STATIONS.	LINES.	REMARKS.
	Converting Cole Levy Lines into Barracks for European Troops.	
	Nos. 1, 2, and 3	Ready for occupation.
	" 4 and 5...	Will be completed by end of May
Darjeeling.		
For a Regt. of Eur. Infy.	20 Half-Company Barracks...	Completed with out-offices.
	Subalterns' Quarters	Completed, except half of mudplaster, white-washing, tarring, painting and glazing.
	Nos. 1 to 6	
	No. 1 Captain's Quarters ...	
	No. 1 Men's Hospital	
	6 Captains' Bungalows ...	Masonry up to plinth done, posts, door-frames and chowkuts fixed.
	1 Subaltern's "	
	1 Female Hospital	
Raneegunge.		
For a Regt. of European Infantry	Iron-framed Barracks Nos. 1 to 5	Completed.
	Nos. 6 to 8	Thatched roofs ready for tiles.
	Outer walls to Iron-framed Barracks	1 and 2 ½ of superstructure done, 3 ½ ditto, 4 to 8 not commenced for want of bricks.
	New additional Hospital ...	Completed.
	Commissariat Godown... ...	"
	Ordnance Store Godown ...	"
	Magazine	"
	Officers' Ranges	"
	2 Skittle Alleys	Masonry completed.
Barrackpoor.	TEMPORARY STABLES.	
	No. 2	Plinth ½ done, posts partly fixed, harness room done.
	No. 3	Wood-work of roof ¾ done, bamboo frame-work ⅔ done.
For 150 Patients ...	Hospital (Iron-frame)... ...	Thatch done and laying tiles over commenced, plastering finished, floor ¾ done, veranda ¾ done.
	Skittle Alley No. 2	Alterations going on.
	Skittle Alley for Artillery ...	Superstructure done.
	Butts for Rifle practice ...	Nearly complete.
Chinsurah.	SOLDIERS' BARRACK.	
	West end and South Veranda	South veranda 2 stories masonry and plastering complete, roof finished, pavements done, west end 2 stories masonry done.
	Dutch Barracks	Will be in use by end of May.
	Racket Court	" "
	Plunge Bath...	Nearly completed.

Stations.	Lines.	Remarks.
Dum-Dum.	Canteen and additions ... } Guard " ... }	Lower story completed, upper story masonry finished, plastering ⅛ done.
	Hospital "	Lower story superstructure completed to beam level, ⅛ timbers up, and superstructure of upper story commenced.
	Upper story of Permanent Barrack No. 3	Superstructure raised to height of beams, ⅝ beams up, and ⅛ burgas and tiling done.
	Raising the roof of European Hospital	Masonry-work and sand plaster completed.
	3 Skittle Alleys	Masonry for 1 Skittle Alley finished, woodwork for roof ¾ done, foundations of others commenced.

List of New Barracks, &c., completed at the several Stations in the Punjab, the North-Western Provinces, Oudh, Nagpoor, and Bengal from the 1st May 1858 *to the* 30*th April* 1859.

PUNJAB.

Attock.—One double Barrack for 64 men, and three single Barracks for 32 men each.

Mean Meer.—One Barrack for 75 Men, Artillery, and eight Privies for Artillery.

Mooltan.—Quarter Guard, Canteen, and six Barracks for six Companies of Infantry.

Umritsur.—Two Barracks in Cantonments, and two in Govindghur Fort.

Rawul Pindee.—Six Married Barracks for Infantry, Medical Subordinates' Quarters, and two Hospitals in Native Infantry Lines.

Murree.—One Barrack for Convalescents and one double Skittle Alley.

Bhagsoo.—Hospital with out-offices and Dead House.

N. W. PROVINCES.

Shahjehanpoor.—Twenty-two thatched Barracks and eight tiled Barracks for two Regiments of Infantry, two Temporary Barracks for Artillery, and four tiled buildings and two Skittle Alleys for Dragoons.

Roorkee.—Barracks with out-offices, Quarter Guard with Cells, Canteen, and Conjee House for a Regiment of Infantry, Engineers' Store-rooms, Magazine, Work-shops, Poontoon Sheds, and Ball Court.

Nynee Tal.—Barracks with out-offices, Quarter Guard, and Skittle Shed for a Regiment of Infantry, Overseer's Bungalow, Hospital, and Medical Subordinates' Quarters.

Bareilly.—Harness Room for Horse Artillery, Main Guard, two Barracks with out-offices, Sergeants' Mess and Reading Room, Skittle Court, and Hospital with out-offices for Horse and Foot Artillery, Hospital for Native Artillery, four Barracks with out-offices, Main Guard, Guard Room, Rear Guard, and Store-room of Hospital for Her Majesty's 42nd Highlanders, five Barracks with out-offices, Main Guard, Rear Guard, Sergeants' Mess and Reading Room and Skittle Court for Her Majesty's 78th Highlanders, Magazine, Canteen, and Sergeants' Mess, Rear Guard, Godown, and Dead House for Her Majesty's 93rd Highlanders, Fire Engine Shed.

Futtyghur.—Barracks and out-offices for a Regiment of Infantry, Quarter Guard, and Magazine.

Moradabad.—Guard, Orderly Room, and Prisoners' Room, Building for Canteen Sergeant and Spirit Store, Skittle Court, two Cook Houses and Hospital for Native Troops.

Jhansi.—Quarters for Cavalry Officers, a Captain's Quarters (Infantry), and Lines for one Company of Native Infantry.

Banda.—Guard Rooms for Infantry and Artillery.

Muttra.—Out-offices of two Barracks, out-offices of Hospital, three Barracks, Hospital and out-offices, Quarter Guard, and Rear Guard for a Wing of Cavalry.

Mhow.—Six temporary Barracks with out-offices and Guard Room for Infantry.

Agra.—One Barrack with out-offices for Infantry.

Fort of Allyghur.—Seven temporary Barracks, one Hospital, and Officers' Quarters for Infantry.

Etawah.—Hospital and Lines for Native Infantry, Lines for Police Battalion, and Staff Sergeant's Bungalow.

[*P. W. Dept.*] *Jounpoor.*—Two Barracks with out-offices.

Bustee.—Officers' Quarters, Staff Sergeants' Quarters, 18 Barracks, three Hospitals, and three Quarter Guards, Stables for 560 Horses, and Sheds for guns and bullocks.

Cawnpoor.—Guard Room for Dragoons, Officers' Quarters, Native Artillery Hospital, Old Riding School.

Allahabad.—Twenty-nine Barracks with subsidiary buildings for Infantry, eight for Cavalry, and four for Artillery, four Hospitals and Officers' Quarters (Infantry and Artillery).

Ghazeepoor.—One tiled Dead House and two Sentry Sheds.

Benares.—Three temporary Barracks and one Married Barrack for Infantry, Main Guard, Orderly Room. At Secrole three temporary Barracks, Main Guard, and Orderly Room, Canteen, Sergeants' Mess and School Rooms. At Raj Ghat two Barracks (one Married), Main Guard, Canteen, Sergeants' Mess and School and Orderly Rooms, Officers' Quarters.

SAGOR AND NERBUDDA TERRITORIES.

Jubbulpoor.—Bullock shed, two ranges of Store-rooms and Guard Room, three Barracks and Canteen for Infantry.

Sagor.—Out-offices to Barracks, five Barracks.

Nagode.—General Hospital and Commissariat Sergeant's Quarters and Store Godowns.

GWALIOR.

Goonah.—Platforms and chuppers for tents for Soldiers and Officers, and Cellar for Porter Casks.

Seepree.—Officers' Quarters.

OUDH.

Gondah.—Huts for Infantry and Artillery.

Fyzabad.—Seven Hut Barracks and two Hospitals for Artillery, seven Hut Barracks and one Hospital for Cavalry, and 40 Hut Barracks and four Hospitals for Infantry.

Seetapoor.—Hut Barracks for Artillery and Infantry, and Hospital Huts.

Sultanpoor.—Eight Hut Barracks and five Hospital Huts.

Roy Bareilly.—13 Huts for Infantry, two for Artillery.

Murriou.—Six Barracks for Artillery, nine Barracks and three Hospitals for Cavalry, 32 Barracks and three Hospitals for Infantry.

NAGPOOR.

Kamptee.—Seven temporary Barracks for Cavalry, temporary Gun-shed, Grand Magazine and Guard Room for Artillery, one Skittle Alley, two Staff Sergeants' Quarters for Infantry.

Chindwarra.—One temporary Barrack and Lines for a Detachment of Native Infantry and Irregular Horse.

Raepoor.—Quarter Guard.

BENGAL.

Dinapoor.—Ten Barracks for Infantry, two Married Barracks, two Barracks for Artillery (one for married men), Canteen, Sergeants' Mess, Main Guard, and nine temporary Barracks for married men.

Berhampoor.—Three upper-roomed Barracks, four married men's Barracks, Artillery Store-room, Gun-shed and Stables, Subalterns' Quarters, and new Guard Room.

Hazareebagh.—Barracks for a Regiment of European Infantry.

Bankipoor.—Two Barracks with out-offices.

Dacca.—Out-offices for Barracks and Magazine and Store-room.

Darjeeling.—Barracks and out-offices for a Regiment of Infantry.

Raneegunge.—Five Iron-framed Barracks, new Hospital, Commissariat Godown, Ordnance Store Godown, Magazine, and Officers' Ranges.

Barrackpoor.—Three Barracks with out-offices for Artillery, 15 Barracks with out-offices for Infantry, Canteen, and Sergeants' Mess, Guard and Orderly Room, Skittle Alley, Ammunition Magazine, Stable for Artillery.

Dum-Dum.—Temporary Artillery Stables, (three) Temporary Barracks, (four) Lower story of Permanent Barrack, upper-roomed Barrack, Work-shop, and Huts for Atillery, one Iron-frame Hospital, and one Barrack, Guard Room, Lock-up, and Store-room Canteen, Prisoners' Cells, and Guard Room, Lock-up and Store-room, Artillery Lines.

N. B.—In addition to the works enumerated above there have been many buildings repaired and adapted for Troops at the several Stations.

APPENDIX B.

Actual and Estimated Expenditure in the Years 1857-58, 1858-59, *and* 1859-60, *the necessity for which has arisen from the late Mutinies.*

	Defensive Works.	Temporary Buildings for the accommodation of Troops.	Permanent Buildings for the accommodation of Troops.	Miscellaneous.	Total.	Total of each Government.
	Rs.	Rs.	Rs.	Rs.	Rs.	
MADRAS ... Actual expenditure from 1st May 1857 to 31st December 1858 ...	32,564	41,485	72,934	3,732	1,50,715	
MADRAS ... Estimated expenditure from 1st January to 30th April 1859 ...	36,950	1,540	6,261	.....	44,751	
MADRAS ... Estimated expenditure for the year 1859-60	2,36,506	325	77,650	.....	3,14,481	
						5,09,947
BOMBAY ... Actual expenditure from 1st May 1857 to 31st December 1858	57,484	6,98,248	1,75,960	2,94,195	12,25,887	
BOMBAY ... Estimated expenditure from 1st January to 30th April 1859 ...	1,204	1,19,871	23,230	1,06,324	2,50,629	
BOMBAY ... Estimated expenditure for the year 1859-60	49,035	2,41,691	6,51,548	85,465	10,27,739	
						25,04,255
N. W. PROVS.... Actual expenditure from 1st May 1857 to 31st December 1858...	6,90,221	16,18,957	19,24,605	57,04010	99,37,793	
N. W. PROVS.... Estimated expenditure from 1st January to 30th April 1859...	34,549	3,95,213	4,85,525	5,60,356	14,75,643	
N. W. PROVS.... Estimated expenditure for the year 1859-60	1,59,350	2,35,400	28,86,478	12,92,781	45,74,009	
						1,59,87,445
BENGAL ... Actual expenditure from 1st May 1857 to 31st December 1858 ...	72,852	13,39,737	7,53,222	1,88,799	23,54,610	
BENGAL ... Estimated expenditure from 1st January to 30th April 1859 ...	17,769	2,01,779	4,74,181	50,070	7,43,799	
BENGAL ... Estimated expenditure for the year 1859-60	.....	52,683	2,07,731	71,000	3,31,414	
						34,29,823
PUNJAB ... Actual expenditure from 1st May 1857 to 31st December 1858...	95,377	75,025	65,705	1,75,557	4,11,664	
PUNJAB ... Estimated expenditure from 1st January to 30th April 1859 ...	18,445	15,005	13,141	40,311	86,902	
PUNJAB ... Estimated expenditure for the year 1859-60	1,74,023	.....	13,35435	1,13,000	16,22,458	
						21,21,024
Carried forward...						2,45,52,494

		Defensive Works.	Temporary Buildings for the accommodation of Troops.	Permanent Buildings for the accommodation of Troops.	Miscellaneous.	Total.	Total of each Government.
	Brought forward ...	.....	.....	.....	.....	.....	2,45,52,494
OUDH ...	Actual expenditure from 1st May 1857 to 31st December 1858 ...	3,31,644	1,93,325	.....	4,65,166	9,95,135	
	Estimated expenditure from 1st January to 30th April 1859 ...	1,16,000	1,34,000	11,48,000	94,328	14,92,328	
	Estimated expenditure for the year 1859-60	10,02,000	5,000	37,00,000	2,62,984	49,69,984	
							74,57,447
NAGPOOR ...	Actual expenditure from 1st May 1857 to 31st December 1858 ...	12,299	92,028	.....	6,618	1,10,945	
	Estimated expenditure from 1st January to 30th April 1859 ...	800	8,216	.....	.....	9,016	
	Estimated expenditure for the year 1859-60 ...	.....	18,648	12,000	.....	30,648	
							1,50,609
HYDERABAD ...	Actual expenditure from 1st May 1857 to 31st December 1858 ...	428	63	.....	3,724	4,215	
	Estimated expenditure from 1st January to 30th April 1859 ...	253	.....	.....	2,587	2,840	
	Estimated expenditure for the year 1859-60 ...	.....	.....	.....	200	200	
							7,255
	Grand Total ...	31,89,753	54,93,239	1,40,13,606	95,21,207	.....	3,21,67,805

APPENDIX C. [*P. W. Dept.*]

GENERAL PRINCIPLES TO BE OBSERVED IN REGARD TO THE ROOFING OF PUBLIC BUILDINGS.

I. Thatched roofs to be considered as absolutely and universally prohibited, except only in cases of buildings of small importance, quite of a temporary character, and removed from other buildings. This prohibition to be held to apply to all sorts of thatching material, whether grass reeds, palm leaves, or whatever it be.

II. Where thatched roofs exist in permanent buildings, the earliest opportunity to be taken of thoroughly replacing them by some less inflammable covering.

III. Where thatched roofs exist in permanent or important buildings and where they cannot be immediately replaced by less inflammable materials, the Chief Engineer of every province to adopt, as soon as possible, the device of tiling over the thatch (removing thatch altogether from the reach of a man's hand near the eaves) whenever the building or the timber of the roof will bear it; or otherwise will do the best be can to reduce the risk of fire from accident or design.

IV. Where tiles are used for roofing buildings to be occupied by Europeans, protection against the sun to be provided by having an inner casing below the tiles, such as lath and plaster ceiling, &c., &c., the object being to have a ceiling protected from the rays of the sun over the apartment occupied by the men and a considerable stratum of air between it and the outer roof. Vetilation also to be provided for in the case of a tiled roof as in any other.

CHIMNIES.

I. Whenever fires are used the Chimnies to be swept monthly and the fact certified.

II. An examination to be made of all Barracks where fires are in use in order to detect and remedy, at whatever temporary inconvenience, Chimnies the defective construction of which endangers the safety of the building.

III. No timber to be allowed to be in contact with a wall containing a flue within four feet of that flue.

[*P. W. Dept.*]

APPENDIX D.

CONSERVANCY OF LARGE TOWNS AND CANTONMENTS.

WITH reference to the very important matter of the Conservancy arrangements of the Station, the Hon'ble the President in Council desires that stringent measures should be taken to put a stop to the indiscriminate defiling of the ground around the Barracks which seems now to be permitted.

2. His Honour in Council would take this opportunity of pointing to the very loose habits which almost every where prevail in Indian Towns and Cantonments, which respect to this matter. It cannot be doubted that the practice of permitting the outskirts of Towns and Bazars to be defiled promiscuously with human ordure, and offal of all sorts is no less objectionable as regards health, than it is disgusting to every person of ordinary refinement. The practice is one which experience has shown may be easily put a stop to by the erection of public Necessaries at suitable places and the establishment of a suitable Establishment of Scavengers to keep them properly cleaned. The local Town or Cantonment Funds will usually supply the means of entertaining such an Establishment, or, where it may be necessary in Military Stations, the Government will be prepared to sanction what is necessary to effect so important an object. The ordinary Police should at once be able to stop all irregularities; when, by the erection of suitable public Necessaries, no excuse remains to any one to defile the streets or fields near his residence.

3. The Officers of the Public Works Department will be directed to co-operate with the Military Authorities in causing the construction of public Necessaries in all Cantonments, and the subject should be referred to the Military Department for re-consideration and the issue of such further orders as may be thought necessaay in that Department.

4. The attention of the Local Governments may also with advantage be generally invited to the importance of establishing public Necessaries in all large Towns, as opportunity offers. It is believed that progress has been made in this essential part of Municipal Police in many places, but the Cantonments of European Troops, whose health it is so essential for us to secure, being usually in the proximity of the chief Towns an additional reason is now given for attention to this subject.

APPENDIX E.

[*P. W. Dept.*]

KUMAON IRON WORKS.

THE delays usual to the commencement of all new works have been experienced in these works from the commencement, consequently they have not made that progress which was anticipated in my General Report dated 23rd August 1858. The delays which have arisen have been chiefly in consequence of the non-arrival of the machinery from England and from Roorkee, which, instead of being on the ground in October 1858, did not arrive till June 1859.

2. Other delays have also arisen by reason of the difficulty of procuring labourers, the new Barracks building in the station of Nynee Tal having taken up a great deal of labour, besides the general demand for labour in the neighbouring stations of Bareilly, Rampoor, Moradabad, Bijnore, &c., to re-build the houses destroyed during the mutiny, caused a scarcity of labour. There was also a general feeling of apprehension on the part of the Hill people to come down to the Bhabur to work owing to the recent disturbances in the Plains. Notwithstanding this, about 1,200 workmen were employed on the ground together with contractors, who probably employed as many more men. Very few however came on the ground before the middle of November. Most of the skilled labourers, such as Carpenters, Masons, Smiths, Brick-makers, &c., were brought from Roorkee and the neighbourhood.

3. The general demand and scarcity of labour also increased the expense of such workmen averaging as much as 25 per cent. over the usual rates, thereby increasing the cost of the work.

4. Notwithstanding the difficulties experienced, a considerable amount of work was accomplished, and the Statements hereunto appended, gives the aggregate amount of work executed and the cost of the same; the unusually wet season too was especially unfavourable to the making of bricks.

DECHOUREE.

5. *The two new Blast Furnaces.*—At this part of the work the foundations and some of the pillars and walls of the Cast House and Engine House were built; also general preparations, such as making bricks, cutting timber, and dressing stone were made. Beyond this little was done for want of the machinery which arrived only in June instead of October, as had been expected, and as before stated.

6. *The Forge Work and Foundry and Fitting Shop.*—The work done for this consisted chiefly in preparing materials, such as bricks, lime and soorkee, digging foundations, and making a tank of 5,032 square yards (area about 1¼ acres) in area, and 8 feet deep, the foundations and a portion of the walls were got up to about 3 feet above the ground.

7. *The Gool.*—This work has proved to be much heavier than was anticipated, and proportionably costly. The original estimate was for a simple water-course cut in the ground, and only partially lined. This was estimated for before the ground could be properly examined, being covered with a dense jungle (since cleared). Such a water-course would have been very inefficient, and the ground is very porous, hence the determination to make it pucka throughout. It was also determined to bring it to a higher level than originally intended, thus securing a better site for the works. The length of the Gool is 1 mile and 25 chains. It has two tunnels of about 200 feet each in length, and two shorter tunnels, three acqueducts, one of three spans, and the others of considerable dimensions. Most of the Gool passes through a hard porous natural concrete with some rock cutting, and the tunnels are through beds with large boulders, and are about 30 feet deep.

8. The Gool was nearly completed before the rains set in, but considerable damage has been done to it, which will involve some outlay in repairing, and it will be necessary to arch over some portions liable to land-slips.

[*P. W. Dept.*] 9. The bund in the river was carried to 10 feet below the bed, and has stood pretty well, except at one side, where it was not quite finished before the rains set in.

10. An Abstract of Expenditure is appended.

11. *The Roads.*—Several roads were made aggregating a length of about 12 miles. The road up to Nynee Tal was for the convenience of the workmen going to the station, and for bringing down pine wood planks and other timber and materials.

12. Besides this there was a road to the houses, another to the plains towards Kaleedoongie for bringing up materials and the machinery.

13. The road to the mines requires a bridge and several culverts; the bridge is about three parts finished.

14. *The European Workmen's Houses.*—The site selected for these houses is high, so as to be out of the influence of the miasma, and, consequently, the cost of erecting them has been very considerable, owing to the additional cost of carrying up the materials; two of the houses are nearly finished and are habitable, a third is more than two-thirds, and the fourth is about half finished. The original estimate for these houses was much too low, and the rates only fit for such work as would be very inferior and temporary. The houses have been built in a most substantial manner; each house is capable of accommodating four workmen.

15. *Native Houses.*—Native houses have been partly built, being about half finished.

16. *The old Works.*—These were found to be in a most dilapidated condition, but were put in repair as well as they could be in order to enable us to get a few tons of iron for our own immediate use, and to try some experiments on the materials. The cost of repairing this furnace, as will be seen by the Abstract appended, was about Rs. 2,400. The other expense incurred was for repairing an old and unfinished bungalow, and about Rs. 650 for payment of materials and tools bought in 1856 for the experiments then made. The repairing of the furnace was finished in December and ready for work. With, however, only one Furnace-keeper nothing could be done. It was tried, but with no good results. On the arrival of the other workmen in March the smelting operations were immediately and successfully commenced.

17. *Manufacturing Account.*—The works have not sufficiently progressed to be able to make out a fair and proper Statement of the cost of producing iron. The Abstract or Analysis appended will show the rates at which the different kinds of materials can be procured. The whole of these rates (except charcoal) are lower than the rates originally estimated for. Ironstone can be delivered at about Re. 1-8 per ton against Rs. 2 originally estimated, and limestone for eight annas per ton against one Rupee.

18. Cost of Charcoal by coolie labour—

	Rs.	A.	P.	
Making	12	6	0	per ton.
Wood 6 Tons at 12 as. 2 pie ...	4	9	0	per ton of Charcoal.
	16	15	0	per ton.

Charcoal by contract costs Rs. 8 per ton. The average cost of the two mixed (as it was used in the furnace) was Rs. 12-7-6 per ton. It is assumed in the Analysis as costing Rs. 15 per ton to allow for waste.

19. The average cost of getting wood cut was annas 12-2 per ton. It has since been cut for less than this sum. As the contractors get used to it they will, it is believed, cut it for 6 annas per ton. The price asked by contractors at the commencement was Re. 1-4 to Re. 1-8 per ton. [*P. W. Dept.*]

20. The experimental trial with the old furnace lasted five weeks, and though it broke down at least twice every 24 hours, still the results obtained from it were of a very satisfactory character so far as they were carried on.

21. The ore yielded 41 per cent. of iron. The iron was uniformly good and very fluid and grey. The flux was also good, producing a good grey cinder. The charcoal made by coolies was good, but that by contract was inferior, soft, and small, hence the quantity used was about 2 tons 4d. per ton of iron. This high quantity was however in some measure affected by the defective construction of the furnace and the inferiority of the wooden blast cylinders.

22. The total cost of producing the 25½ tons of iron made was Re. 1-15-5 per maund or Rs. 54-15-8 per ton exclusive of European labour.

23. The balance sheet appended shows the total expenditure on the making of iron during the five weeks which the furnace worked, including European labour, as Rs. 3,297 1 9

And the value of iron made ... ... " 6,475 14 8

Showing a balance in favour of the works of ... Rs. 3,183 12 11

the rates charged being about the average of rates at present charged at Roorkee.

24. A portion of the iron was made into castings for the new works. Two tons were sent to Roorkee, and five tons were given to Messrs. Davis and Co. to enable them to go on with their works, the five tons to be returned or to be paid for.

25. That the manufacturing account is not more satisfactory than it is, is owing to the non-arrival of the machinery, but it is so far satisfactory in producing a small and much needed supply of pig iron to work upon; and when it is considered that furnaces in England very frequently work for several weeks at commencing without making a single ton of iron worth anything, the result may be regarded as encouraging, especially as not a lb of bad iron was made during the time the furnace was at work. The sample of rail sent on to Calcutta was run direct from the furnace.

Ramghur Work.

26. Difficulty has always been experienced in getting workmen at Ramghur, though for what reason is uncertain, the works have consequently progressed but slowly.

27. *The German Forge*, which has been built, could not be completed for want of castings.

The hammers have since been put up and work quite well, the blast is not so satisfactory, the boxes being made out of green wood (the only wood obtainable).

28. An English fan blast has been carried up and will be worked until iron cylinders can be made. Wooden ones can never be made air-tight for any length of time in India.

29. About 5 tons of iron were made for our own immediate use by the common native process. This process is very expensive and very unsatisfactory when the labour has to be hired. Consequently, as soon as a small supply was obtained for our own immediate use, it

[*P. W. Dept.*] was discontinued. The expense of producing the iron is given in a balance sheet, and its value. This shows a trifling balance of Rs. 62-3-1 in favour of the works. The quantity of iron made would not have been procured at any price in the Province, and it enabled us to go on with our other works ; the bars sent to Calcutta as sample were drawn out under the tilt hammers.

30. Some native houses have been built, and also an European bungalow.

31. A blast furnace has also been commenced, the walls of the cast house are now up all round, and the furnace itself a few feet above the foundations. The engine for this furnace was partly cast at Dechouree last cold season, and will be fitted and sent up during the ensuing working season.

32. Iron ore has been obtained from a mine opened a little way from the works; the iron ore can be obtained at Rs. 6 per ton; it yields 70 per cent. of iron.

33. The forge will be in full work in a very short time.

34. An Abstract is hereunto appended of the Expenditure on the works; also of the Expenditure on manufacturing account.

35. In conclusion it may be stated that the delays consequent upon the non-arrival of the machinery, want of tools, &c., can never occur again. The effect of these delays will however probably be to cause the works to cost 25 per cent. in excess of the original estimates.

Statement of Work done at Dechouree from November to April 1859. [*P. W. Dept.*]

Two Blast Furnaces.			
Excavation	Cubic feet	...	37,578
Timber sawn	" "	...	2,014
" "	Square feet	...	12,691
Bricks moulded, large size	...	...	3,78,540
" burned " " pucka	...	...	1,15,000
" " " " peela	...	...	18,400
Kutcha Brick-work	Cubic feet	...	7,513
Pucka "	" "	...	3,052
Stone Work	" "	...	2,568
Lime made and used	Maunds	...	803
Pymanahs of Limestone supplied	Pymanahs	...	130
Soorkee crushed	Maunds	...	1,660
Bricks carried from Kiln to Works	...	...	46,500
Foundry, Fitting-Shop, &c.			
Excavation	Cubic feet	...	84,374
Bricks moulded	...	...	1,50,000
" burned pucka	...	...	46,000
" " peela	...	...	11,000
Kutcha Brick-work	Cubic feet	...	8,213
Pucka work	" "	...	5,498
Lime made and used	Maunds	...	1,598
Lime-stone supplied	Pymanahs	...	217¾
Stones for building supplied	"	...	149
Bricks carried from Kiln to Works	...	...	31,192
New Gool.			
Excavation	Cubic feet	...	2,06,268
Timber sawn	" "	...	158
Arch Bricks moulded	...	...	54,200
" " burned pucka	...	...	22,000
" " " peela	...	...	5,700
Brick-work, pucka	Cubic feet	...	501
Stone-work	" "	...	85,881
Plastering of bottom of Gool	Square "	...	13,281
Lime made and used	Maunds	...	16,570
Stones supplied by contract	Cubic feet	...	62,066
Lime-stone " "	Pymanahs	...	134
Soorkee crushed "	Maunds	...	135
Total length of Gool 1 Mile, 25 Chains.			
Bridges, Culverts, Roads, &c.			
Excavation	Cubic feet	...	3,458
Fitting up	" "	...	10,494
Stone-work	" "	...	28,019
Lime made and used	Maunds	...	3,120
Lime-stone supplied	Pymanahs	...	158
Total length of Roads about 12 miles.			
New Bungalows.			
Excavation	Cubic feet	...	18,108
Timber sawn	Square "	...	8,064
" "	Cubic feet	...	3,382
Tiles moulded	...	...	16,500
" burned pucka	...	...	14,300
" " peela	...	...	2,200
Stone-work	Cubic feet	...	21,396
Plastering of Walls	Square "	...	7,585
Roof tiled and plastered	" "	...	1,652
Flooring plastered	" "	...	1,111
Boarded flooring	" "	...	243
Lime made and used	Maunds	...	5,083
Stones supplied for building	Cubic feet	...	8,264
Soorkee crushed	Maunds	...	20
Lime carried to Bungalow	"	...	3,520

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Old Works Repairing, &c.		
Timber sawn	Square feet	1,775
" "	Cubic "	535
Bricks moulded		5,000
Cubic feet of kutcha Brick-work	Cubic feet	625
Stone-work	" "	2,987
Boarded floor	Square "	898
Lime made and used	Maunds	877
Out-Houses or Native Houses.		
Timber sawn	Square feet	6,193
Stone-work	Cubic "	6,687
Lime made and used	Maunds	1,646
Stones supplied	Cubic feet	7,138
Lime carried from Kiln to Bungalow	Maunds	1,000
Making Charcoal.		
Bricks moulded		5,000
Kutcha Brick-work in Kiln	Cubic feet	621
	tns. cwt. qrs. lbs.	
Charcoal made	320 18 1 25	
" obtained by contract	82 5 2 38	
Wood cut and delivered in jungle by contract	Tons	13,405
Lime-stone collected	"	60
Jungle felled	Square yards	1,733—608
Iron-stone quarried	Tons	2,783
" calcined	"	175
Blowing Machines.		
	tns. cwt. qrs. lbs.	
Castings made	3 1 2 4	
Ramghur Forge.		
	tns. cwt. qrs. lbs.	
Castings made	1 19 2 17	
Making Iron.		
	tns. cwt. qrs. lbs.	
Pig made	19 8 1 0	
Castings	0 4 0 0	
" for new Blast Furnace	0 16 0 0	

KUMAON IRON WORKS.

Statement of Expenditure on the Works at Dechouree from their commencement to the 30th April 1859.

Year.	Indent No. 1						Indent No. 2.	Indent No. 5.	
	Estimate No. 1, 2 Blast Furnaces.	Estimate No. 2, Forge Works.	Estimate No. 3, Gool.	Estimate No. 4, Roads, &c.	Estimate No. 5, European Houses.	Estimate No. 6, Native Houses.	Charcoal, Iron-stone, &c.	Old Furnace.	Total.
Original Estimate.	39,096 8 6	31,087 1 0	2,084 0 0	3,000 0 0	3,848 0 0	2,000 0 0	39,700 0 0	2,500 0 0	1,23,315 9 6
October 1858	706 13 2	... ...	... ...	... ...	45 14 0	... ...	... ...	390 4 11	1,143 0 1
November "	1,018 11 11	348 11 5	666 10 4	138 9 7	262 0 2	... ...	655 2 11	688 3 1	3,778 1 5
December "	1,075 8 0	... ...	1,869 0 4	788 12 8	1,147 7 1	... ...	975 15 9	1,293 0 11	7,149 12 9
January 1859	485 0 6	397 12 0	2,860 3 11	862 1 2	3,360 6 6	... ...	5,775 14 9	437 2 5	14,178 9 3
February "	1,329 5 6	756 5 1	2,361 10 0	1,823 4 0	2,577 8 9	333 7 3	7,961 13 6	359 0 3	17,502 6 4
March "	963 4 0	973 0 6	2,611 10 4	1,404 9 0	1,252 15 6	652 7 6	1,607 1 5	659 14 6	10,124 14 9
April "	1,100 15 3	1,584 12 4	2,275 14 2	297 8 0	1,251 5 0	206 12 10	1,875 2 10	59 10 8	8,652 1 1
Total ...	6,679 10 4	4,060 9 4	12,645 1 1	5,314 12 5	9,897 9 0	1,192 11 7	18,851 3 2	3,887 4 9	62,528 13 8

[P. W. Dept.

KUMAON IRON WORKS.

Abstract of Amount expended in building two Blast Furnaces at Dechouree (Estimate No. 1) from the commencement to 30th April 1859.

1858-59.	Cutting Foundation.	Building Brick Kiln.	Brick Moulding Floor.	Moulding Bricks, &c.	Burning Bricks.	Building Furnaces.	Sawing Wood.	Bringing Wood from Forest.	Wood for burning Bricks.	Carrying Bricks to Work.	Dressing for lining.	Materials for Works.	Lime and Lime-stone.	Grass for covering Machinery.	Carrying Materials.	TOTAL.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
October 1858	... ...	... ...	... ...	... ...	... ...	... ...	94 11 8	... ...	... ...	... ...	... ...	562 9 0	... ...	... ...	49 8 6	706 13 2
November "	104 8 5	209 1 2	68 10 5	23 6 0	... ...	... ...	438 15 0	174 2 11	... ...	... ...	... ...	... ...	... ...	... ...	...	1,018 11 11
December "	225 10 9	59 14 5	107 7 7	129 0 9	101 0 9	... ...	441 5 9	... ...	... ...	... ...	... ...	11 0 0	... ...	... ...	...	1,075 8 0
January 1859	... ...	... ...	... ...	108 9 8	87 1 4	... ...	289 5 6	... ...	... ...	... ...	... ...	... ...	... ...	... ...	...	485 0 6
February "	... ...	... ...	... ...	502 11 8	... ...	... ...	187 0 6	... ...	12 8 0	... ...	137 6 1	489 11 3	... ...	... ...	...	1,329 5 6
March "	7 0 0	... ...	... ...	367 0 0	... ...	... ...	82 15 11	10 6 0	... ...	93 0 0	205 10 7	2 3 6	195 0 0	... ...	...	963 4 0
April "	... ...	... ...	... ...	... ...	267 3 6	540 0 10	... ...	15 9 0	195 0 0	... ...	... ...	... ...	63 3 0	19 14 11	...	1,100 15 3
Total ...	337 3 2	268 15 7	176 2 0	1,130 12 1	455 5 7	540 0 10	1,534 6 4	200 1 11	207 8 0	93 0 0	343 0 8	1,065 7 9	258 3 0	19 14 11	49 8 6	6,679 10 4

KUMAON IRON WORKS.

Abstract of Expenditure on Foundry, Fitting-Shop, and Forge Works at Dechouree (Estimate No. 2) from the commencement to 30th April 1859.

1858-59.	Lime-making.	Brick-making.	Dry Foundation.	Digging Reservoir.	Carrying Bricks and Stones.	Pounding Soorkee.	Materials.	Building Works.	Temporary Sheds.	Total.	Remarks.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	
October 1858 ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	
November " ...	348 11 5	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	348 11 5	
December " ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	
January 1859 ...	... ...	397 12 0	... ...	... ...	... ...	... ...	... ...	... ...	... ...	397 12 5	
February " ...	... ...	208 10 2	... ...	... ...	... ...	... ...	547 10 11	... ...	... .	756 0 1	
March " ...	361 4 6	462 9 0	10 0 0	... ...	40 0 0	... ...	18 11 6	80 7 6	... ...	973 0 6	
April " ...	191 4 8	437 0 0	80 6 0	62 13 0	296 15 0	28 0 0	11 4 0	437 3 10	39 13 10	1,584 12 4	
Total ...	901 4 7	1,505 15 2	90 6 0	62 13 0	336 15 0	28 0 0	577 10 5	517 11 4	39 13 10	4,060 9 4	

[P. W. Dept.

KUMAON IRON WORKS.

Abstract of Expenditure on the building of Gool or Water-Course at Dechouree from the commencement to 30th April 1859.

1858-59.	Lime-making.	Excavation of Bund.	Preparing Stones for walling.	Excavation in Gool.	Building Gool.	Brick-making for Arches of Tunnels.	Sawing Timber for Aqueducts.	Repairing Tools.	Materials.	TOTAL.	REMARKS.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	
October 1858	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	
Nov. "	376 2 6	90 4 6	123 3 1	... ...	... ...	... ...	... ...	62 8 3	14 8 0	666 10 4	
Decr. "	391 11 9	... ...	... ...	... ...	1,362 14 5	... ...	71 8 7	17 1 7	25 12 0	1,869 0 4	
January 1859	576 2 1	... ...	... ...	485 3 0	1,774 6 7	... ...	22 1 0	... ...	2 7 3	2,860 3 11	
Feby. "	618 1 11	50 0 0	... ...	... ...	1,611 6 2	24 11 4	... ...	... ...	57 6 7	2,361 10 0	
March "	624 10 2	... ...	... ...	451 9 0	1,415 8 11	112 13 9	... ...	... ...	7 0 6	2,611 10 4	
April "	323 0 9	30 0 0	110 0 0	1,271 0 0	430 10 7	105 15 7	... ...	... .	5 3 3	2,275 14 2	
Total ...	2,909 13 2	170 4 6	233 3 1	2,207 12 0	6,594 14 8	243 8 8	93 9 7	79 9 10	112 5 7	12,645 1 1	

Length of large Tunnel 216 lineal feet.

KUMAON IRON WORKS.

Abstract of Expenditure on Roads and Bridges at Dechouree from the commencement to 30th April 1859.

1858-59.	Materials. For Bridge.	Lime Kiln. For Road-making.	Bridge. Over River Boer.	Culverts.	Road-making to Kaleedoongie.	Road to Nynee Tal.	Road to Houses.	Road to Plains.	Road to Mines.	Total	Remarks.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	
October 1858 ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	
Nov. " ...	... ...	... ...	138 9 7	... ...	... ...	... ...	... ...	... ...	... ...	138 9 7	
Dec. " ...	... ...	147 5 2	591 7 6	... ...	50 0 0	... ...	... ...	... ...	... ...	788 12 8	
January 1859 ...	... ...	173 8 9	688 8 5	... ...	... ...	... ...	... ...	... ...	... ...	862 1 2	
February " ...	93 12 0	... ...	889 8 0	... ...	... ...	840 0 0	... ...	... ...	... ...	1,823 4 0	
March " ...	7 0 6	... ...	739 10 3	284 9 3	... ...	... ...	100 0 0	323 5 0	... ...	1,404 9 0	
April " ...	... ...	197 8 0	... ...	... ...	... ...	... ...	... ...	... ...	100 0 0	297 8 0	
Total ...	100 12 6	518 5 11	3,047 11 9	284 9 3	50 0 0	840 0 0	100 0 0	323 5 0	100 0 0	5,314 12 5	

[P. W. Dept.]

KUMAON IRON WORKS.

Abstract of Expenditure in Building European Houses at Dechouree from the commencement to 30th April 1859.

1858-59.	Materials.	Lime-making.	Sawing Timber.	Building Bungalows and carrying Materials.	Gool for Bungalows.	Tile-making for Roofs.	Carrying sum.	Total.	Remarks.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	
October 1858 ...	45 14 0	... ...	... ...	... ...	... ...	... ...	... ...	45 14 0	
November " ...	... ...	114 10 8	147 5 6	... ...	... ...	... ...	... ...	262 0 2	
December " ..	13 11 0	153 3 11	299 13 1	573 7 8	19 9 1	87 10 4	... ...	1,147 7 1	
January 1859 ...	565 8 0	196 1 6	505 6 4	2,059 1 8	... ...	34 5 0	... ...	3,360 6 6	
February " ...	228 0 1	143 12 5	419 1 8	1,441 11 3	... ...	93 1 4	251 14 0	2,577 8 9	
March " ...	4 1 6	46 7 3	278 13 6	923 9 3	... ...	... ...	... ...	1,252 15 6	
April " ...	8 6 9	127 2 2	... ...	985 6 1	... ...	26 14 0	103 8 0	1,251 5 0	
Total ...	865 9 4	781 5 11	1,650 8 1	5,983 3 11	19 9 1	241 14 8	355 6 0	9,897 9 0	

Abstract of the Manufacturing Account of Deckwere from the commencement to the 30th April 1859.

Month.	Timber sawing in Pieces.		Mining and Cutting up in Logs.		Mining, not by contract.		Carrying out to Harbour.		Carrying out to Harbour by contract.		Unclassified Expenses.		Making charcoal, by workmen.		Boilerplate charcoal, by contract.		Making charcoal, by contract.		Crushing and coyes for exportation.		Cutting wood in Logs.		Material for Iron Blasting.		Blacksmithing, Sharpening.		Burning charcoal.		Making sawing the Blast Blasting.		Material for use of Blast Blasting.		Mining Iron Ore.		Making Iron Ore.		Material for Iron Ore.		Carriage of Iron Ore to Furnace.		Carriage of Iron Ore from the Iron Ore Furnace.		Wages.	Expenses.
	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Amount.	Quantity.	Amount.	Amount.	Quantity.	Amount.	Amount.	Quantity.	Amount.	Amount.	Quantity.	Amount.	Amount.	Quantity.	Amount.	Amount.	Quantity.	Amount.	Amount.	Unit of making 100 Bloc. 4 Sacks of Iron.
November 1858	No. 9,700 14000	40 1 0	Tons 70	10 10 0	—	—	—	—	—	—	—	—	2 0 0	40 7 10	—	—	Wheelbarrow 17 11 0	2 0 0	—	—	31 0 0	2 0 0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	200	2 0 0	One week ... 2 0 0
December "	10000	25 10 0	10	10 0 0	—	—	—	—	—	—	—	—	2 0 0	25 0 0	—	—	2 0 0	2 0 0	—	—	22 0 0	2 0 0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	100	2 0 0	One week ... 2 0 0
January 1859	14000	37 0 0	Tons 70	10 0 0	Tons 1,000	200 0 0	—	—	—	—	—	2 0 0	2 0 0	50 0 0	—	—	2 0 0	2 0 0	200	2 0 0	2 0 0	2 0 0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1,000	2 0 0	Charcoal ... 40 at 1 3 0 each, as per Bills ... 2 0 0
February "																					2,000	4,000	2,000	4,000	2,000	4,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1,000	2 0 0	Iron ore for 2 Blasting ... 2 0 0
March "																					2,000	4,000	2,000	4,000	2,000	4,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1,000	2 0 0	Limestone ... 2 0 0
April "																					2,000	4,000	2,000	4,000	2,000	4,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1,000	2 0 0	Materials for Blast Engines ... 2 0 0
Total	124000	402 1 0	80	20 10 0	1,000	200 0 0	40 10 0	10 1 0	2 0 0	40 10 0	2 0 0	4 0 0	80 15 0	4,000 10 0	40 0 0	2 0 0	40 0 0	80 15 0	400	4 0 0	80 0 0	160 15 0	8,000	16,000	8,000	16,000	8,000	16,000	40 0 0	2 0 0	40 0 0	2 0 0	40 0 0	2 0 0	40 0 0	2 0 0	40 0 0	2 0 0	40 0 0	2 0 0	4,000	80 0 0	Total ... 160 0 0
	1 Cubic foot = 80 cubic feet.	1,000 at 2 per cent.	1 ton = 2,000 pounds.	50 at 2 per cent.	1 Cubic foot = 1 cubic foot.	200 at 2 per cent.	1 Cubic foot = 1 cubic foot.	40 at 2 per cent.	1 Cubic foot = 1 cubic foot.	40 at 2 per cent.	1 Cubic foot = 1 cubic foot.	2,000 at 2 per cent.	1 Cubic foot = 1 cubic foot.	4,000 at 2 per cent.	1 Cubic foot = 1 cubic foot.	2,000 at 2 per cent.	1 Cubic foot = 1 cubic foot.	4,000 at 2 per cent.	1 Cubic foot = 1 cubic foot.	2,000 at 2 per cent.	1 Cubic foot = 1 cubic foot.	4,000 at 2 per cent.	1 Cubic foot = 1 cubic foot.	8,000 at 2 per cent.	1 Cubic foot = 1 cubic foot.	16,000 at 2 per cent.	1 Cubic foot = 1 cubic foot.	8,000 at 2 per cent.	1 Cubic foot = 1 cubic foot.	16,000 at 2 per cent.	1 Cubic foot = 1 cubic foot.	40 at 2 per cent.	1 Cubic foot = 1 cubic foot.	2,000 at 2 per cent.	1 Cubic foot = 1 cubic foot.	40 at 2 per cent.	1 Cubic foot = 1 cubic foot.	2,000 at 2 per cent.	1 Cubic foot = 1 cubic foot.	40 at 2 per cent.	1 Cubic foot = 1 cubic foot.	2,000 at 2 per cent.	1 Cubic foot = 1 cubic foot.	40 at 2 per cent.	1 Cubic foot = 1 cubic foot.	2,000 at 2 per cent.	1 Cubic foot = 1 cubic foot.	4,000 at 2 per cent.	1 Cubic foot = 1 cubic foot.	80 at 2 per cent.	1 Cubic foot = 1 cubic foot.	

Number Gold of Workmen at per week, weekly.

Price wages daily pay
" overtime
"
"

Bills. Rates
160 0 by month.
20 0 for new works.
10 0 For Deckwere
10 0 for new Blast Engines.

Total 160 0 at 20 per week, weekly.

KUMAON IRON WORKS.

Abstract of Expenditure on the Old Works at Dechouree from the commencement to the 30th April 1859.

1858-59.	Repairing Blast Engine and Furnace.	Materials for Old Furnace.	Sawing Timber for Old Engine.	Bringing Materials.	Repairing Old Bungalow.	Out-houses to Old Bungalow.	Stable and Godowns.	Materials for Old Bungalow.	Sawing Timber for Out-houses and Stable.	Tools, &c., former Works 1856.	Total.	Remarks.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	
October 1858 ...	299 13 11	90 7 0	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	390 4 11	
November " ...	291 13 9	117 10 7	... ...	9 0 0	147 9 6	11 12 10	110 4 5	... ...	... ...	... ...	688 3 1	
December " ...	632 12 10	114 3 0	74 5 1	17 0 11	171 1 4	8 13 2	102 1 10	57 5 2	115 5 7	... ...	1,293 0 11	
January 1859 ...	419 4 7	... ..	17 13 10	... ...	... ...	... ...	... ...	... ...	... ...	... ...	437 2 5	
February " ...	162 15 9	191 0 6	5 0 0	... ...	... ...	... ...	... ...	... ...	... ...	.. ...	359 0 3	
March " ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	659 14 6	659 14 6	
April " ...	... ...	... ...	... ...	... ...	59 10 8	... ...	... ...	... ...	... ...	... ...	59 10 8	
Total ...	1,806 12 10	513 5 1	97 2 11	26 0 11	378 5 6	20 10 0	212 6 3	57 5 2	115 5 7	659 14 6	3,887 4 9	

Total for repairing Old Furnace, Rs. 2,443-5-9.

DECHOUREE IRON WORKS.

Dr. *The Manufacturing of Iron Account per contra during the five weeks the Works were in operation.* *Cr.*

	Rs. A. P.	Rs. A. P.
European.		
2 European Keepers 5 weeks	520 13 4	
2 " Moulders 4 "	500 0 0	
		1,020 13 4
Materials.		
T. cwt qr. lbs.		
63 0 0 0 Charcoal expended @ Rs. 15-0-0 per ton	945 0 0	
7 15 2 24 Lime-stone 218 mds. " 0 5 3 ...	3 6 6	
62 4 1 4 Iron-stone 1,742 " " 0 1 0 ...	108 3 0	
Other materials for Iron-making	91 6 0	
" " for Blast Engine	9 8 9	
		1,157 8 3
Labour working Blast Furnace	245 3 9	
" making Casting for Ramhgur	110 1 2	
" " " for new Blast Engine ...	251 15 10	
Materials for new Blast Engine ...	135 9 0	
Fitting new Blast Engine	91 5 4	
Repairing Water-Course	195 7 1	
Carrying Castings to Ramghur	84 2 0	1,113 12 2
Total	....	3,292 1 9
To Balance in favour of works	....	3,183 12 11
		6,475 14 8

	T. cwt. qr. lbs.	Mds.	S.	Rs. A. P.	Rs. A. P.
Iron made	19 8 1 0	543	22 A	8 0 0	4,348 6 4
Castings Cylinders made for Blast Engine	3 1 2 4 ...	86	6 B	15 0 0	1,292 4 0
Ramghur Forge	1 19 2 18	55	24 C	10 0 0	555 2 0
For new Blast Furnace	0 16 0 0	22	16 D	10 0 0	224 2 4
For old " "	0 4 0 0	5	24 E	10 0 0	56 0 0
	25 9 1 22	713	9		6,475 14 8

A { These prices are the same as charged at Roorkee.

B { Castings of Cylinder are charged 27-8 per Maund at Roorkee.

C D E { Prices at Roorkee Rs. 16 to 18 per Maund for such Castings.

6,475 14 8

KUMAON IRON WORKS.

[*P. W. Dept.*]

Summary of work done at Ramghur from the commencement to the 30th April 1859.

Forge Works.		
* Masonry in Lime Kiln	200	cubic feet.
Dry Masonry on walls of Water-Course	19,342	"
Masonry in Forge Building	6,148	"
Excavation in Forge	2,016	"
" in Gool	11,089	"
" in Hammers	990	"
Lime-stone delivered on work	500	maunds.
Charcoal delivered on work	2,095	"
Timber delivered on ground rough	6,475-8	
Planks delivered for Forge-work rough	2,448	square feet.
Slates delivered for out-house	232	slates.
Manufacturing Account.		
Mine opened 157 feet in length	157	feet.
Iron-stone delivered	1,070	maunds.
Iron made into Bars	5	tons.
	m. s. c.	
Converted into Tools	16 20 8	
6 Native Houses Built.		
Masonry in walls	3,987	cubic feet.
Wood cut	303	square feet.
Slating stones	200	slates.
Timber delivered	16	cubic feet.
European Houses and Out-houses.		
Masonry in house	8,607	cubic feet.
" in out-house	2,350	"
Lime-stone delivered for houses	400	maunds.
Timber cut for house	2,271	square feet.
" "	649	cubic "
Pieces for roofs of out-house	100	pieces.
Slates	800	slates.
Floors plastering	834	square feet.
Walls "	2,352	"
Blast Furnace.		
Masonry in Furnace	1,288	cubic feet.
" in Lime Kiln	864	"
Lime-stone delivered	1,900	maunds.
Timber delivered	366	cubic feet.
Kurrees	44	"
Planking cut for scaffolding, &c.	2,285	square feet.

KUMAON IRON WORKS.

Statement of Expenditure on the Works at Ramgihur from the commencement to the 30th April 1859.

Year.	Indent No. 11. Forge Works.	Indent No. 6. Blast Furnace.	Indents Nos. 7 and 7A. House.	Indent No. 8. Native Houses.	Indent No. 9. Roads.	Indent No. 10. Manufacturing Account.	Indent No. 12. Shop and Office.	Indent No. 13. Foundry.	Total.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Original Establishment ...	3,000 0 0	10,741 0 0	1,462 0 0	500 0 0	500 0 0	6,820 0 0	600 0 0	500 0 0	24,123 0 0
July 1858	552 3 1	... ...	... ...	... ...	... ...	... ...	... ...	... .	552 13 1
August "	579 13 0	... ...	... ...	... ...	... ...	... ...	... ...	... ...	579 13 0
September "	441 6 2	... ...	... ...	... ...	... ...	... ...	... ...	... ...	441 6 2
October "	1,013 15 0	... ...	... .	... ...	... ...	146 2 0	... ...	... ...	1,160 1 10
November "	172 13 0	... ...	... ...	352 11 6	... ...	596 0 0	... ...	... ...	1,121 8 6
December "	208 6 6	... ...	149 8 0	141 13 9	... ...	542 2 0	... ...	... ...	1,041 14 3
January 1859	36 0 0	... ...	328 11 0	38 0 0	27 0 0	674 4 0	... ...	... ...	1,103 15 0
February "	37 14 0	229 15 7	324 4 6	... ...	... ...	171 0 0	... ...	... ...	763 2 1
March "	136 2 0	324 6 0	570 12 0	... ...	... .	77 0 0	... ...	... ...	1,108 4 0
April "	5 10 0	798 11 6	412 4 0	... ...	66 8 0	443 13 7	... ...	912 0	1,736 11 1
Total	3,184 3 7	1,353 1 1	1,785 7 6	532 9 3	93 8 0	2,650 5 7	... ...	9 1 0	9,608 15 0

RAMGHUR WORKS.

Manufacturing Account.

[*P. W. Dept.*]

Dates	Mines.		Blacksmiths.		Bar Iron Makers.	Materials for Mines	Iron-stone by Contractor. *		Blooms Bought. *		Delivering Iron.	Smith making Tools.	Carrying Iron from Mines.		Stone wgts. for weighing.	Charcoal by Contract.		Godowns. ¶	Time Keeps.	Materials for Godowns.	Tax. *	Total.	Remarks
1859 and 1860.	Quantity.	Amount.	Amount.	Amount.	Amount.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Amount.	Amount.	Quantity.	Amount.		Quantity.	Amount.	Amount.	Amount.	Amount.	Amount.	Amount.	
	Maunds.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Maunds.	Rs. A. P.	Maunds.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Maunds.	Rs. A. P.	Rs. A. P.	Maunds.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	
October 1859 ...	70	60 0 0	16 0 0	14 13 0	3 5 0	100	80 0 0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	146 2 0	
November " ...	.....	33 8 0	193 10 6	.....	2 5 0	.....	.....	.....	300	300 0 0	2 7 6	8 0 0	.....	.....	1 6 0	.....	.....	.....	.....	.....	336 0 0	
December " ...	400	96 0 0	229 4 0	.....	2 8 0	.....	.....	.....	.....	.....	1 0 0	3 0 0	400	40 0 0	.....	300	78 0 0	.....	.....	.....	342 2 0	
January 1860 ...	400	96 0 0	288 8 0	.....	0 13 0	.....	.....	.....	118	102 4 0	.....	8 7 0	300	30 0 0	.....	518	129 12 0	2 8 0	5 0 0	.....	674 4 0	
February " ...	.....	96 8 0	43 0 0	.....	.....	.....	.....	.....	.....	.....	.....	21 0 0	.....	.....	.....	.....	.....	6 0 0	2 8 0	.....	171 0 0	
March " ...	.....	.....	.....	.....	.....	200	80 0 0	.....	.....	.....	.....	.....	.....	.....	.....	300	25 0 0	6 0 0	.....	.....	77 0 0	
April " ...	.....	.....	66 0 0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,140	332 1 7	6 0 0	.....	4 12 0	55 0 0	443 13 7
Total ...	770	442 0 0	837 8 6	14 13 0	10 1 6	300	76 8 0 or 0 8 1 per maund.	428	403 4 0 or 0 15 10 per maund.	8 7 6	42 7 0	700	70 0 0 or 0 1 7 per maund.	1 6 0	2,065	561 13 7 or 0 4 3 per maund.		20 8 0	7 8 0	4 12 0	55 0 0	2,650 5 7	
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	

KUMAON IRON WORKS, RAMGHUR.

Dr. *Manufacturing Account at Ramghur per Contra.* *Cr.*

	Rs.	A.	P.	Rs.	A.	P.	1859.		Rs.	A.	P.	Rs.	A.	P.
Labour of Blacksmiths...	937	9	4				A.	125 maunds, 10 seers, 5 chittacks @ Rs. 10	1,252	9	0			
" Bar-Iron Makers	14	13	0					Tools, 80 Sledge-hammers, Khoolarees, &c., &c.,						
" Tool Makers...	42	7	0					16 maunds, 20 seers, 8 chittacks @ Rs. 31-4.	516	0	0			
" Time Keeper	7	8	0				B.	Total iron made 140 maunds, or 5 tons ...	...	...	...	1,768	9	0
				992	5	4								
A. P.														
270 Maunds of Iron-stone @ 4 0½	68	3	3											
352 " of Blooms used @ 15 10	348	5	4											
1,120 " of Charcoal used @ 4 3	297	8	0											
				714	0	7								
				1,706	5	11								
Balance in favour of Works ...	...	...	...	62	3	1								
Total ...	...	...	...	1,768	9	0						1,768	9	0

A. Present Bazar rates for common Native lumps.
B. Roorkee rates for Tools.

[P. W. Dept.]

[*P. W. Dept.*]

APPENDIX F.

From Offg. Secy. to Govt. of India, P. W. Dept., to Offg. Cons. Engr. to Govt. of India, Railway Dept., No. 852, *dated* 21*st January* 1859.

MAJOR GOODWYN'S letter No. 2320, dated the 30th September last, having been laid before the Hon'ble the President in Council, I am directed to communicate the following observations and orders relative to the system to be followed in keeping the record of the land made over to Railway Companies, and to the terms of its occupation. The present instructions will be held to supersede all former orders that have been issued on these subjects.

2. And first I am to observe that the business of the Government of India, in reference to the land question, is limited to the determination of principles, and that it need not interfere in matters of detail beyond what may be necessary to see that the principles adopted are not neglected, and that all necessary information is from time to time given to the Local Governments under whom the details of this branch of business are carried out.

3. The President in Council believes that there is little that calls for correction or change in the orders that have been heretofore issued relative to the terms on which land is provided for Railway purposes; but for convenience and greater precision I am now to recapitulate the main points to which attention is requisite in dealing with this subject.

4. The land required for Railway purposes may be divided into four classes: A., B., C. and D. First, Class A., land which a Railway Company receives free of charge under the contract with the Government for permanent occupation. Second, Class B., land also provided free of cost, but only for temporary occupation. Third, Class C., land which the Railway Company has to provide at its own cost. Fourth, Class D., land which does not come into the possession of the Railway Company at all.

5. Class A. will comprise the land required for the permanent works of the Railway, including the road with its bridges, &c., and all stations, workshops, permanent store-houses and the like, necessary for the Line when opened. The occupation of this land by a Railway Company will be so far permanent, that it will only cease when their contract expires and the whole lapses to Government. It is all provided free of charge.

6. Class B. will contain land essential for the execution of the permanent works of the Railway, but not required after the completion of the Line in part or in whole. It also is provided free of charge. Such is land for spoil banks, for extra excavation to make banks, for river diversion, and for the storage of Railway materials held in stock by the Railway Company, pending the construction of the Line or their dispatch to the works.* The occupation of this class of land will be temporary. On its restoration to the Government, the proper time for which will be settled in each case between the Railway Officers and the Consulting Engineer, it will be for the Revenue Officers to dispose of it to the best advantage in the interests of the Government.

* This last sort of land is allowed free under the Right Hon'ble the Secretary of State's letter No. 24 of 30th November 1858.

7. Class C. will contain the land which a Railway Company has to provide at its own cost. This is the land which is required for the provision or preparation of materials; for purposes contingent on the actual execution of the works on the Line, or for other miscellaneous objects which the Government recognizes as falling legitimately within the scope of the Railway Company's operations, though not giving the Company a claim to the provision of land free of charge. As a Railway Company is bound to pay for the construction of all works out of the capital, receiving only from Government without charge the land on which the works stand, the provision of all materials and the conveniences requisite for the execution of all works are to be at the cost of the Railway Company. In this class, therefore, will fall all land for brick-

making, for quarrying ballast, for roads to works in progress, for houses for persons employed [*P. W. Dept.*] on the works, &c. So also land taken for Hotels built in connection with Railway Stations, for houses for Engine Drivers and the like on the Line when opened, and for other similar purposes will come under Class C. It is proper to bear in mind that this land will in part be deteriorated by the use to which it is put, and in part will not be so deteriorated. Further, the occupation of some of it will be temporary, and of some of it may be permanent. In all cases, however, it will be most convenient to deal with the land in the first instance in the same manner. It will be taken possession of by Government and handed over to the Railway Company for occupation at a fair rental. When the necessity for occupation ceases, the land will be given up again to Government by the Railway Company, the proper time for this being determined, as under Class B., by the Railway Officers and Consulting Engineer. On its restoration to Government the Revenue Officers will examine the condition of the land. If it has not been deteriorated, all claim against the Railway Company will then cease on account of it. If it has been deteriorated, the Revenue Officers will assess the amount of the injury done, and the Railway Company will pay that sum which, like the rent, will be charged against the Railway capital. In both cases the Revenue Officers will then further dispose of the land in the best way possible.

8. Class D. will contain that land which, being required in consequence of the works of a Railway, still does not come into the occupation of the Railway Company; it will be provided free of charge. It will be exclusively land for roads, either new roads leading to Railway Stations, or diversions, or changes of old roads made necessary by the Railway works.

9. It may here be observed that, in the opinion of the Government of India, inconvenience is likely to arise if Railway Companies are permitted to hold land on their own account or otherwise than is above explained. By causing them to rent from the Government all land to which they are not entitled free in the manner above explained, simplicity in the tenure of their property will be secured, which will be a matter of importance at a future time when the Railway may be transferred to Government. The determination of the value to be paid by the Government for any land not included in Class A. which might be held by a Railway Company would certainly be, in such an event, a great embarrassment.

10. It is further necessary to point out that houses, trees, tanks or other property on land which is not provided free of charge, and for which special payment or compensation is necessary, will be paid for at once by the Railway Company. In the case of land provided free of charge the materials, &c., derived from the "clearance" of the surface, which then will be at the expense of Government, will be disposed of by the Revenue Officers to the best advantage.

11. All land required for a Line of Railway will be applied for in continuous portions; the plans will be drawn to a scale of 150 feet to the inch, and the measurements and areas will be recorded in accordance with the fiscal divisions of village estates or mouzahs, pergunnahs and zillahs in a schedule, of which a form is annexed, showing in detail the several classes to which the land belongs.

12. The several classes of land will be coloured pink, yellow, purple, and green respectively in the plans, and the exact purpose to which each parcel of land is to be devoted will be noticed in the schedule.

13. Detached portions of land should be referred to some fixed point on one of the main sheets with such distances and compass or other bearings as will enable the land to be identified at once. A corresponding entry should also be made on the main sheet to draw attention to the detached portion.

[*P. W. Dept.*] 14. The general correctness of the plans and schedules of the Railway Engineers being attested by the Consulting Engineers to Government, the applications will be forwarded to and dealt with as may be necessary by the Revenue Authorities under the orders of the local Government. The Revenue Officers are to be held strictly responsible for the regular adjustment by Railway Companies of all charges on account of land to be determined in the manner ove explained.

15. A complete set of land plans should be recorded in the Chief Engineer's Office each Railway, and a copy forwarded to the Consulting Engineer to Government, by whom uplicate will be given to the Revenue Board, which, in turn, will supply Collectors of stricts with transcripts of parts included in their respective zillahs. When it may be found pedient, in order to expedite the making over of the land, to employ a special Land Commissioner for this duty, the Railway Engineers should supply an additional copy of the land n for the use of the Land Commissioner.

16. The Consulting Engineer to Government and the local Revenue Authorities will respctively be held responsible for the punctual fulfilment of the foregoing orders in their several partments, and for the careful record of plans in their respective Offices.

17. All contemplated changes in the land in possession of a Railway Company should be mptly reported by the Railway Agent to the Consulting Engineer to Government, who will tify the same to the local Government. It will be for the latter to see that the necessary ps are taken by the Revenue Authorities for entering such changes in their records, and for rying out all further proceedings that are requisite on such an occurrence.

18. It will be necessary for the Local Governments to see that a correct register and re-d of title of all Railway lands is maintained, for the whole of such lands will one day ert to the Crown. Also that all rents or payments for clearances, &c., chargeable in behalf of vernment against the Railway Company are duly realized.

19. It is evident that, up to the present time, these two last-named points have, to a at extent, escaped attention. The Local Governments will be requested to remedy this, and make enquiry as to what plan, if any, is now followed in these respects, and what is propos- to be done in future.

20. The Hon'ble the President in Council has learned, with some surprise, from Major odwyn's Report before quoted, that there is not in existence a complete record or complete lection of plans of the land which now is, or has at any time been, in the occupation of the st Indian Railway Company. The Consulting Engineer recommends that a systematic ision of the subject should be made under the Railway Chief Engineers in Bengal and rth-Western Provinces respectively District by District throughout the whole extent of their rges, and that correct land plans should be made on a scale of 150 feet to the inch in tinuous sheets based on the fixed mileage marks of the Railway with proper schedules, whole to be in every way in accordance with the standard laid down in the earlier portion this letter.

21. The President in Council approves of these recommendations and directs that such ans and schedules shall be prepared as soon as possible. Copies will be forwarded by you to e Local Governments, as ordered in the case of new applications when attested by the Consult- g Engineer or his Deputies, for the issue of such orders as the Local Governments may con- ler necessary to ensure a complete record of the title, and an equitable adjustment of all ims of Government against the Railway Companies on account of rent, &c.

22. In conclusion I am to point out that it is very essential that there should be for each Railway *one* set of plans in a regular sequence to show all the land; and that the plans of each Railway Company's estate, after they have once been prepared, should constantly be corrected and always be maintained complete. If mere copies of plans of any fresh pieces of land that may be occupied are deposited for record in separate sheets, without seeing that the record is constantly maintained in a complete form, in a very few years everything will certainly again fall into confusion. [*P. W. Dept.*]

LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY

[*P. W. Dept.*]

APPENDIX G.

RETURN No. 1.

ACCIDENTS TO PASSENGERS.

Madras Railway, G. I. P. Railway.

East Indian Railway.

No passengers were killed or injured (as far as the reports received by the Government of India show) on either the Madras or Great Indian Peninsula Railway during the year 1857. One native passenger was killed on the East Indian Railway at the Pundooah Station.

While the Train, by which the man referred to was travelling, was stopping at the Station for the passage of a Goods Train, he got out of the carriage on the wrong side and sat on the rail. At this time the Goods Train came up making the usual signals. The Driver and others seeing the man's danger also called out to him, but he failed to get out of the way, was run over, and killed. The man was certainly in fault, but it was the business of the Railway Establishment to prevent persons sitting on the rails, and to see that the Line was clear.

ACCIDENTS TO SERVANTS OF RAILWAY COMPANIES OR PERSONS EMPLOYED ON RAILWAYS.

East Indian Railway.

THERE have been eight of these cases on the East Indian Railway, seven of which proved fatal.

The fatal accidents are as follows:—

1st. A cooly employed on a bridge near the Muggra Station attempted to cross the Line when the Train was approaching, and was knocked down and killed.

2nd. An East Indian Fireman, at about 7 P. M., feeling tired after his day's work, sat down on the rails leading from the round shed, where he fell asleep. A Pilot Engine going into the shed ran over him, crushing his legs and arms. The man died about two hours after.

3rd. A gate-keeper attempting to cross the Line was knocked down and killed by an Express Mail Train.

4th. A cooly was run over by a Ballast Train while endeavouring to cross the Line with a basket of bricks, when the Train was about 20 yards off, though warned by his fellow labourers and the whistle of the Engine.

5th. A cooly attempted to pass a Coal Train while it was shunting, but fell, and a wagon passed over his legs. He died subsequently in hospital.

6th. A native porter was knocked down and killed by an Engine which was coming to take a wagon into a siding, when pushing on the same wagon by hand without any orders. The man tried to get out of the way of the Engine, but fell and was run over.

7th. A native in charge of treasure and ammunition jumped out of a Van unobserved by the Guard, and was run over and killed.

The man injured was a cooly, who, whilst shunting Ballast Trucks, fell off one of them and was run over by the Engine of a Special Ballast Train, a leg and foot were broken.

Great Indian Peninsula Railway.

Five such accidents are reported to have occurred on the Great Indian Peninsula Railway, three of which proved fatal.

The following are the two cases in which persons were injured :— [*P. W. Dept.*]

1st. A wagon number taker was injured while shunting some wagons at a siding.

2nd. A Fireman was injured owing to the breakage of the connecting rod of an Engine.

The cases which were attended by death are as follows :—

1st. A Fireman was killed owing to the accident last referred to.

2nd. A servant of the Railway Company was thrown off a Truck and received injuries from which he died. The absence of a Signaller was noticed.

3rd. A Guard of a Special Train was killed at a Viaduct by slipping from the step of a Break Van.

Madras Railway. Two such accidents occurred on the Madras Railway, both proved fatal :—

1st. A cooly was squeezed to death under a Ballast Wagon. The Station Master was blamed for inattention to Regulations.

2nd. A cooly employed with a Ballast Train lost his balance and fell on the rail. The wheels of the Train passed over one of his legs and nearly severed it from his body. The man died not long afterwards.

ACCIDENTS TO PERSONS NEITHER PASSENGERS NOR SERVANTS OF RAILWAY COMPANIES.

East Indian Railway. On the East Indian Railway there occurred two cases, both fatal :—

1st. A native crossing the Line at an unauthorized place was knocked down by an Engine and killed.

2nd. A native was run over near the Paneeghur Station while throwing bricks at a Passenger Train. The man was standing between the rails. The steam was shut off and the whistle sounded, but before the Train could be stopped it passed over him. He was supposed to be a fanatic.

Great Indian Peninsula Railway. Two fatal accidents are also reported to have occurred on the Great Indian Peninsula Railway. Both the victims were native women who attempted to cross the Line when the Train was in motion.

RETURN No. 2.

ACCIDENTS FROM ENGINE OR CARRIAGE LEAVING THE RAILS.

East Indian Railway. Six accidents of this nature happened on the East Indian Railway, and all six owing to the negligence of servants of the Company :—

1st. The 1st and 2nd Class Carriages of a Down Express Mail Train were thrown off the Line by a Pointsman. The man, who had been sleeping, just awoke as the Engine and Break

[*P. W. Dept.*] Van had passed over the points, when he suddenly shifted the latter. The Train was detained 55 minutes.

2nd. Two Wagons of a Train were thrown off the Line and the Train detained for nearly 12 hours. A piece of timber was loaded in a Coke Wagon and became unfastened. It projected over the side of the Wagon and came in contact with and injured the Water Column and Station Pillars at Chandernagore. A Clerk was to blame, and a Telegraph Signaller having caused delay in the transmission of a message, it was proposed to subject the Railway Electric Telegraph Establishment to the provisions of Act XXXIV. of 1854.

About this time (July 1857) a reference was made to the Agent of the East Indian Railway Company as to the advisability of adopting the Bombay practice of posting up placards of punishments inflicted on Railway offenders. The plan was adopted, and placards are now posted up both in the English and Vernacular languages.

3rd. Part of an Up Special Train was turned into the proper Line, and the remainder turned up the straight Line owing to the Pointsman having let go the points when part of the Train was over. Two Trucks got off the Line. The Train was delayed for nearly an hour.

4th. The Engine, Tender, and three Trucks of an Up Goods Train were thrown off the Line and detained for upwards of four hours. The rolling stock was slightly damaged. The Station Master (a native) employed an inexperienced Pointsman who let go the lever during the passage of the Train. The Station Master was removed and an European employed instead. It was intimated to the Railway Company that inexperienced Pointsmen should be placed for some time under the supervision of experienced men.

5th. The Locomotive of an Up Goods Train was thrown off the Line and seriously damaged. An employé in the Store Department, who brought a pair of Tender wheels from a siding on to the main Line, was not to blame, the head of his Department not having circulated the latest Time Table. The latter was severely censured.

6th. The Engine, a 1st Class Carriage, and the Break Van of an Express Mail Train were thrown off the Line owing to the facing switches or points not having been locked. The leading or driving and trailing wheels of the Engine ran into the siding and took different roads. The Engine, Tender, Break Van and Carriage were injured, and damage was done to the Permanent Way. The Up and Down Goods Trains were delayed about 17 hours in consequence. The Station Master and Pointsman were dismissed.

Great Indian Peninsula Railway.

Of nine such accidents which are reported to have occurred on the Great Indian Peninsula Railway five were owing either to the inexperience or negligence of Pointsmen, two were accidental, one was attributable to the breakage of the lever of the points at a siding, and one was caused by a Guard having incautiously given the signal to start without seeing that the points were attended to.

Madras Railway.

One such accident occurred on the Madras Railway by the breaking of the trenails. Iron spikes were substituted.

MISCELLANEOUS.

East Indian Railway.

THE miscellaneous accidents on the East Indian Railway were five in number. Four of these were accidental. One arose from the mismanagement of an Engine Driver, who was severely punished.

In the case last referred to the lead plug of the Engine melted out.

In three of the other cases detention was caused owing to buffaloes having been run over. In one of these cases the feed pipes both of Engine and Tender were considerably damaged.

In the fourth case a fire took place in the Break Van of a Goods Train, and is supposed to [*P. W. Dept.*] have originated from a spark from the Engine while being raked at Mymaree, having been blown into the locker of the Van within which a mass of jute and oil was stored, through the opening in the end of it originally intended for a lamp. The fire was not discovered at the time, but when it was it was speedily extinguished.

The possibility of the accident having arisen from spontaneous combustion was pointed out, and it was directed that all holes, similar to that which was supposed to have caused the accident, should be stopped.

Here it is proper to notice sundry attempts, happily unattended by success, which were made by unknown, and unfortunately still undetected, individuals to throw Trains of the East Indian Railway Company off the Line. In one case a Permanent Way guage was used. Rewards were offered for the detection and conviction of the offenders, and it was remarked that most likely the guilty parties must have been in the service of the Railway Company either at the time the malicious attempts were made, or prior to that time.

Great Indian Peninsula Railway.

No less than *seventeen* miscellaneous accidents are reported to have occurred on the Great Indian Peninsula Railway. Seven of these arose either from the defective construction of machinery, or the mismanagement of Drivers. It is not exactly known which, as the causes are not stated in the Returns sent up. Six are attributable to the negligence of servants of the Company, and four were accidental.

In two of the last mentioned cases buffaloes were run over. In one a horse box was on fire, and in the other a Wagon. The fire is supposed to have originated from sparks from the Engine.

In two of the cases attributable to negligence the Engines failed owing to the leaky state of the tubes. In one case damage was caused to an Engine by the Train having struck against a sleeper found across the Line. In another the fire bars of an Engine were burnt owing to the want of sufficient attention on the part of the Driver. The like inattention caused the fifth accident, which was a collision between an Engine and empty Wagons standing on the Line. The sixth accident was also a collision owing to the absence of a Signal-man. This case was attended by the death of a native who was thrown off a Truck.

Of the seven cases put under the head of Defective Construction of Machinery three were owing to the breakage and one to the failure of the *valve* spindle of Engines, one to the breakage of the feed pipe of an Engine, one to the failure of an Engine, from what particular cause is not stated, and the last to the breakage of the connecting rod of an Engine. In this case two Firemen were burned and scalded, one of whom died.

RETURN No. 1.

Number of Persons killed and injured from all causes on the Railways in India during the year 1857.

	East Indian Railway.		Bombay G. I. P. Railway.		Madras Railway.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
PASSENGERS.						
Passengers killed and injured from causes beyond their own control	...	...	...	...	...	...
Passengers killed and injured owing to their own misconduct or want of caution	1	...	...	...	...	...
Total Passengers killed or injured ...	1	...	...	...	...	...
PEOPLE CONNECTED WITH THE RAILWAY.						
Servants of Company or of Contractors killed or injured from causes beyond their own control	...	1	3	1	2	...
Ditto owing to their own misconduct or want of caution	7	...	...	1	...	...
Total Railway people killed or injured	7	1	3	2	2	...
OTHERS NEITHER PASSENGERS NOR CONNECTED WITH THE RAILWAY.						
Trespassers killed or injured while crossing or walking on the Railway	2	...	2	...	...	...
Suicide	...	...	...	...	...	...
Total persons unconnected with Railway or Contractors injured or killed	2	...	2	...	...	...
Grand total killed and injured	10	1	5	2	2	...
Length of Railway open at the termination of the year	121 Miles.		88½ Miles.		81 Miles.	
Number of Passengers conveyed during the year	10,88,697		6,70,210		1,72,985	

RETURN No. 2.

Statement of Accidents upon Railways in India during the year 1857 *showing the nature of the Accidents and the number of Persons killed and injured thereby.*

Nature of Accidents.	No. of Accidents.	Passengers or persons unconnected with Lines.		Causes of Accidents.												
				Purely accidental.	Causes arising from the Rolling Stock or the Road.				Cause attributable to the Management.				Negligence of Servants.	Improper interference by persons not under control of Company.	Malicious attempt by persons not under control of Company.
					Neglect of		Defective condition of		Defective Discipline.						
									Unpunctuality.		Insufficient or inadequately enforced Regulation.	Defective system for securing intervals between Trains.			
		Killed.	Injured.		Machinery of Train.	Road.	Machinery of Train.	Road.	Accidental.	Defective or inadequately enforced system.					
East Indian Railway.															
Accidents from Engine or Carriages leaving the rails ...	6	...	...	...	...	...	...	..	...	...	...	...	6	...	...
Accidents from Trains running through facing points ...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...
Accidents from persons in Trains being struck against works adjacent to Line	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous	5	...	...	4	...	...	...	...	...	...	...	...	1	...	...
Total	11	...	...	4	...	...	...	...	...	...	...	...	7	...	...
Great Indian Peninsula Railway.															
Accidents from Engine or Carriages leaving the rails ...	9	...	...	2	..	...	...	1	...	...	...	...	6	..	...
Accidents from Trains running through facing points ...	..	...	...	...	...	...	...	...	..	...	...	...	...	...	...
Accidents from persons in Trains being struck against works adjacent to Line	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...
Miscellaneous	17	2	1	4	...	...	7	...	...	...	...	...	6	...	...
Total	26	2	1	6	...	...	7	1	...	...	...	...	12	...	...
Madras Railway.															
Accidents from Engine or Carriages leaving the rails ...	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Accidents from Trains running through facing points ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Accidents from persons in Trains being struck against works adjacent to Line	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Grand Total	38	2	1	10	...	...	8	1	...	...	...	...	19	...	...

[P. W. Dept.

[*P. W. Dept.*]

APPENDIX H.

Progress Report of the Works on the E. I. Railway in Bengal for the half-year ending June 1859, *dated 8th August* 1859.

ON the opened Line from Howrah to Raneegunge, and from the Junction to Beddiah, in all 142 miles, the Works, including the Permanent Way, are in a sound and excellent condition, and no interruption to the traffic has occurred during the last six months.

On the 121 miles from Howrah to Raneegunge the amount of Engine mileage during the six months ending 30th June last has been... ...	399,476
The amount for the preceding six months was	330,195
Increase.....	96,281
The number of passengers conveyed in the last six months has been ...	680,354
The number conveyed during the preceding six months	591,578
Increase.....	88,776
The gross amount of merchandize and minerals carried during the last six months has been	148,166 tons.
The gross amount in the preceding half-year was	101,079 "
Increase.....	47,087 tons.
The gross earnings during the last half-year amounted to ... ... Rs.	1,298,977
The same for the preceding half-year came to ... ... "	929,484
Increase Rs.	369,493

The annexed Tabular Statement shows that the cost of maintenance of Way and Works for the half-year has been Rs. 115,739-8-9, being a rate of R. 0.4 7.62, or, in English money, $6\frac{3}{4}d$ per Train per mile.

This cost is about $\frac{1}{4}d$ a mile lower average than for the last half-year of 1858, notwithstanding the more extended use of twisted wrought-iron spikes. The gradual substitution of these for wooden trenails has caused the increased expenditure under the head of Materials.

The annexed Statement B. shows the number of sleepers taken out and put in during the six months. In the last six months 6,585 sleepers were used, in the preceding six months 5,018, total consumed during the year 11,604 sleepers. In round numbers 12,000 sleepers on 121 miles, or not far short of 100 sleepers a mile.

Some sleepers of inferior quality had, from absolute necessity, been used both for repairs and laying down the second road; on this account, and also because the road cannot now be considered a new road, it would not be prudent or safe to calculate for the future on so low an average as 100 sleepers per mile per annum, but rather to expect an expenditure gradually increasing and then becoming stationary. For the next five years the average may be as high as 250 sleepers a mile, or about 30,000 per annum between Howrah and Raneegunge. Some years must yet elapse before the average duration or life-time of a sleeper can be approximated.

The demand for timber in India for Railway purposes, more especially for sleepers, in addition to the ordinary requirements of the country and for Barracks and other public works at present very far exceeds the supply; prices have risen accordingly, and much difficulty

is just now experienced in supplying the wants of the Railway. His attention having been turned to this subject for some years past, the Chief Engineer suggested the trial of a road entirely of wrought-iron which would remove some of the difficulties. Although Permanent Way of the description now in use is ordered and in hand for the whole of the Line up to Delhi, yet, seeing that it is only for a single track, and that an additional quantity will certainly be required for sidings, branches, and for doubling the Line at certain places, the experimental mile of iron road sanctioned by the Government of India some time ago should be tried with as little delay as possible. This road will be the ordinary "bridge" rail or "foot" rail on a longitudinal wrought-iron bearing. [*P. W. Dept.*]

The rails throughout the opened Line are standing extremely well, the quality of the iron is excellent, and, with a few isolated exceptions, it may be said that no failure has taken place.

The turn-tables, water-columns, weigh-bridges, switches, and other apparatus are all in good working order.

The most important works in progress during the half-year were the carriage and wagon shops at Howrah, which have been completed and handed over to the Carriage-building Department. There is now an area under roof for the carriage builders of no less than 168,225 superficial feet. Next in importance is the doubling of the Line to the Junction, of which the part from Burdwan to Mymaree, 15 miles, is finished, and the bridges on the remaining part, from Mymaree to Pundooah, are in a forward state. It is expected that the whole will be completely finished before the middle of October next. There will then be a double Line from Howrah to the Junction affording accommodation for a traffic equal to that of any Line in England.

The second platform for the "Down" Trains at Burdwan is finished, and also the iron foot-bridge at that Station. Improved facilities will thus be afforded for working the heavy traffic at that Station where hitherto all Trains both Up and Down have been obliged to resort to the same platform.

To meet the increase in the coal traffic the loading wharf at Raneegunge, which requires great enlargement, will be extended to the assigned limits with all possible dispatch. The work has been commenced.

The increase of traffic generally has been so great, that the enlargement and improvement of the whole of the Stations generally, and of Howrah Station in particular, have become almost a matter of necessity. The Plan of these will soon be presented with their several Estimates. Further, the advantages of the double over a single Line are so manifest as the traffic increases, that it may be necessary, as a question of true economy, to say nothing of the security it would afford against accidents, to take up the subject of continuing the "doubling of the Line" from the Junction to Raneegunge, a distance of 47 miles.

South Beerbhoom District, 45 Miles.

In the last Report it was mentioned that a road was likely to be completed over the River Adjai Bridge about the end of June, and that the Line would be ready for public traffic to Cynthea before the end of this year. This expectation has been realized.

Cynthea Station is 118 miles from Howrah, and thus there is 165 miles of opened Line in Bengal.

North Beerbhoom, 33½ Miles.

The works on this District have made rapid progress. The earth-work, amounting in all to 74,000,000 cubic feet, is almost completed, and will be entirely finished before the end of the present rainy season.

[*P. W. Dept.*] Of brick-work the total quantity is 2,278,000 cubic feet, of which 1,784,000 cubic feet are executed, or 78 per cent. of the whole. The annexed Table C. affords full information as to the brick-work on this and all the other Divisions. The amount executed in the last twelve months is no less than 1,011,574 cubic feet, of which 780,000 cubic feet were executed in the last half-year, giving an average of 130,000 a month.

The Canal Bridge of three 54 feet spans has been waiting for the iron girders for the last six months. The Dwarka Bridge of seven 60 feet spans has been ready for the iron girders for some time. The Braminee Bridge is in a forward state; it consists of seven 30 feet arches and nine spans of 60 feet each of iron-work. The arches will all be turned in the course of next month. The piers are all in hand, and will be ready for the iron-work about the end of this year. Good progress was being made with all the other bridges when the works were interrupted by the somewhat premature commencement of the rains.

Judging from last season's operations, there seems no doubt of the whole of the brick-work being finished before the end of March 1860. Some of the iron girders have already been received, others are in the river and will soon be landed at Howrah, and the remainder are onthe way out.

During the last six months about 1,000,000 cubic feet of ballast have been collected. About 50 per cent. of all that is required is now on the ground, part spread and part ready for spreading. All the ballast is excellent in quality.

Of the Permanent Way 17 miles are laid down, 10 of which are quite complete and ready for a Locomotive and Train of carriages. All the sleepers are on the ground, and also rails sufficient for 25 miles.

This District, with the exception of the Rampoor Haut Station, will be completed in all likelihood in the month of June 1860.

South Rajmehal Division, 23½ Miles.

The whole of the earth-work on this Division amounting to 70,000,000 cubic feet is finished. A large portion of the embankments are here much exposed to the action of the flood waters including both the upland water floods and those of the Gangetic inundation. The trimming, planting or grassing is carried on generally throughout, but more particularly at the exposed parts through the Jheels of Amboab, Nobinuggur, Suggrumpoor or Gambria, and in Dadpoor Jheel. At those difficult points advantage was taken of the earliest rains in May to strengthen and secure the slopes. The whole are now brought up to their full height, and this year's rainy season will put the embankments to an experimental proof both as regards their capability of withstanding the wash of the floods, and also as to the sufficiency of the openings provided for the passage of the water; so far at least as one season's experience extends. The Chief Engineer entertains very satisfactory impressions with regard to the stability and completeness of these extensive works.

The total quantity of brick-work being 800,000 cubic feet, and the quantity executed being 605,507 cubic feet, it follows that 75½ per cent. has been completed, leaving to be executed 194,493 cubic feet. The quantity executed in the last six months amounted to 500,000 cubic feet, that is, to an average of 83,000 cubic feet a month. Taking into account the large stock of materials already on the works, it is confidently expected that all the brick-work will be finished before April 1860.

About 50 per cent. of the ballast is prepared, partly spread and partly ready for spreading as soon as rails and wagons are procurable. Of Permanent Way 10 miles of rails are already laid down. A quantity sufficient for four miles is on the ground, and about 10 miles, or 1,300 tons, are still to be delivered.

Progress is much impeded by the want of Permanent Way and of the iron girders and ballast wagons, but as these wants are in a fair way of being supplied, there appears no reason why the works should not be finished as soon as those on the last mentioned or North Beerbhoom District. [*P. W. Dept.*]

Central Rajmehal Division, 26 Miles.

Extending to the Ganges at Rajmehal.

The total quantity of earth-work is 72¼ millions of cubic feet. Of this 90 per cent. is completed.

Of the brick-work 600,000 cubic feet nearly have been accomplished since the date of the last Report. The total amount is 1,365,566 cubic feet, of which 62 per cent. is finished, leaving 511,279 cubic feet for next season's work. For this there are already on the ground above six millions of bricks, so that there seems little doubt, unless some unforeseen event occur, that all the brick-work will be finished before June 1860.

Of ballast the total is 5,100,000 cubic feet, of which 1,380,000 feet, or 25 per cent., are on the works, leaving still to be provided 3,720,000 cubic feet.

Of Permanent Way 8¾ miles are laid, and rails are delivered for 14¾ miles, leaving still to be delivered about seven miles, which is inclusive of the Rajmehal Station.

The arrangements for the supply of labour and materials have been successful, and with some trifling exceptions, the foundation of every Bridge has been effected, and the principal superstructures are well advanced.

Assuming that the iron girders and the Permanent Way materials will be delivered in reasonable time, of which there now seems almost a certainty, the Chief Engineer anticipates with considerable confidence that the entire Line will be open for a Train to Rajmehal on or about the 1st July 1860, and that it may be made available to the public soon after.

North Rajmehal Division, 25 Miles.

Of earth-work 91 per cent. is completed. It may be said to be all completed as the remainder consists chiefly of Bridge approaches and additions to slopes.

The total quantity of brick-work amounts to 712,000 cubic feet, of which 154,433 cubic feet, or 25 per cent. only, are executed; but as the remainder is not large in comparison with other Districts, and as complete arrangements are made for supplies of fuel, and the most difficult of the foundations being already executed, there does not seem any great difficulty in finishing all the brick-work during the ensuing season.

The ballasting is well advanced, 17 per cent. is spread, and 60 per cent. more is collected ready for spreading as soon as rails are available.

Materials for 5½ miles of Permanent Way are delivered, sleepers for the remainder are in course of delivery, the remainder of the rails are in great request, as little progress can be made now without rails and wagons except at a great extra cost for carriage.

Peerpoyntee or Colgong Division, 26 Miles.

The earth-work is very nearly finished in this Division. Although only 44 per cent. of the brick-work is executed, which is a smaller amount than was anticipated, yet the foundations of most of the Bridges are secured, and as the remainder to be done does not exceed 512,000

[*P. W. Dept.*] cubic feet, in aid of which there is nearly 7½ millions of bricks on the works, there seems a fair probability of the whole of the works, including ballasting for a single Line, being finished about the end of 1860.

No Permanent Way is laid, but there are delivered rails for about a mile-and-a-half, and a few chairs. The want of these materials has here, as elsewhere, retarded progress. If full supplies be sent up in time the Permanent Way may also be ready against the end of 1860.

Colgong Station Plans are before the Government of India, and the works will be prosecuted with vigour as soon as they receive sanction, and may be ready as soon as the works of the main Line.

The amount of coal led to the works from the Company's Collieries at Bhorah and Hurrah during the season 1858-59 was 420,255 maunds; the deliveries were spread over a period of nine months.

Bhagulpoor Division, 23 Miles.

The total quantity of earth-work on this Division amounts to 88,230,000 cubic feet. Above 80 per cent. is finished, the rest will be finished in the course of next season. The competition for labour of all kinds has been very great, and the necessity for urging on the excavation for the large Bridge foundations in the flooded lands withdrew the labour from the embankments, which would otherwise have been completed. No ultimate delay will, however, ensue on this account.

The total amount of brick-work being 1,360,000 cubic feet, exclusive of Station, and the amount executed being 719,796, it follows that 53 per cent. of the whole has been completed, leaving to be done 640,204 cubic feet. No less than 423,333 cubic feet were built during the last six months.

The largest works on this Division are:—1st, the Coah Bridge of five 60 feet spans, of which the east and west abutments are built up to the natural surface of the ground, and one pier half finished. 2nd, Chandpoor flood arches, 30 of 15 feet span, finished. 3rd, Geroah Nuddy Bridge, of five spans 60 feet each; the east abutment is built up 12 feet high, the west abutment to level of ground, all the four piers founded and well advanced. 4th, the little Ghogah Bridge, of three 60 feet spans; the east abutment is built to level of the ground, the west abutment nearly the same, both piers found and built to level of the plinth. 5th, the great Ghogah Bridge, of five spans 60 feet each; both abutments are founded and built about 20 feet in height, the excavations for the piers were carried down 17 feet below the river bed, for the wells on which the piers are to stand the soil has turned out so unusually difficult that the completion of these piers will occupy nearly the whole of next working season. 6th, the Champun Nuddy Bridge, of five spans 60 feet each; one abutment and one of the piers are founded and well advanced, and it is anticipated that the rest will be out of hand in the course of the ensuing cold season.

All the abovementioned are works of considerable difficulty, as the land is inundated by the Ganges floods every year to some depth, the foundations have generally to be laid very deep, and many preparations are necessary for taking advantage of the working season.

No Permanent Way materials have been delivered since the last Report on the subject, but five miles are ballasted and ready for the rails, and nine miles besides are ready for ballast. Of ballast 1,249,000 cubic feet are on the ground ready for spreading, and half as much more will soon be available; the remainder will be ready as soon as it is wanted.

The Bhagulpoor Station has been begun, but no great progress can be made until the Plans receive the sanction of Government.

On this Division a stock of building bricks amounting to 10,208,000 is ready for next season's operations. [*P. W. Dept.*]

With respect to time of completion much depends upon the delivery of Permanent Way materials, but the Line may be expected to be ready about the end of 1860, including the great Ghogah Bridge, which will be one of the works. The last was an unfavourable season for work of any kind on the low lands, and more specially for brick-burning, as the rain fall at Ghogah in the month of—

April was	...	4.95 inches.
May	... ...	5.15 "
June	... ...	12.17 "
		22.27 inches.

This quantity, unusual for the time of year, and accompanied as it was by violent storms, destroyed quantities of unburnt bricks, the Ganges rose very rapidly, and before the 1st of July overflowed lands at Geroah, Ghogah, and other places which, last season, were not flooded until the 3rd of August.

Jehangerah Division, 20 Miles.

Of the embankments 8 miles are finished, nearly 7 miles thrown up but not dressed, 4¾ miles partially done, and 1¼ mile not commenced. The whole of the earth-work amounts to 53½ millions cubic feet, of which 31¾ millions, or nearly 60 per cent., are executed; the remainder can be completed without much difficulty before the close of 1860.

The amount of brick-work is somewhat over-rated in the annexed Schedule C., the real amount being 8,78,000 cubic feet, of which are executed 92,595 cubic feet, or 10½ per cent. of the whole.

The only works of importance on this Division are the Ghoorghat Nullah Bridge of three spans of 60 feet each, the Meriah Nullah, of five 60 feet spans, and the Burriarpoor Nullah Bridge, also of three 60 feet spans, all calculated for iron girders. At two of these the brick-work for two of the abutments had just been commenced when the works were stopped by the floods. All these Bridges are on land annually submerged.

There is a large stock of bricks on hand, sufficient, probably, to complete one-third of the remainder of the brick-work, so that the whole of the brick-work should be completed before the close of the year 1860.

A small part of the Line, about a mile in length, is ballasted. Of ballast not spread there is on the works 20,39,512, which is sufficient for 13 out of 20 miles of this Division. About the full amount of sleepers have been delivered, but no rails or other Permanent Way materials.

It would be possible, if it were required, to open the Line here sooner, but it will be safest to state Christmas of 1860 as about the probable time of completion, always assuming that the Permanent Way materials and iron girders are forthcoming in time.

Monghyr Division, 31½ Miles.

Of the embankments 10 miles are completely finished, 10 miles thrown up but not dressed, 9 miles about three-fourths finished, and about a mile-and-a-half not begun. The total amount of earth-work, including the heavy rock cuttings at each end of the Tunnel, is 53,274,052 cubic feet, of which 49,613,477 cubic feet are executed, or above 93 per cent. of the whole. Judging from late progress, there appears no doubt that the earth-work will all be completed before July 1860.

[*P. W. Dept.*] The total of brick-work, as in the annexed Statement, amounts to 16,72,342 cubic feet, of which 617,027 cubic feet, or 37 per cent. of the whole, are executed. There is a deficiency of brick-clay on this Division of a quality which gives a good out-turn, and as none but the best bricks are used, progress has been slow on this account. The use of the rubble stone of the neighbourhood has not hitherto been so successful as was anticipated, but in this an improvement is taking place. The use of covering sheds will in future be extended to all the brick yards, at considerable increase of cost in the first instance, but with an eventual saving from the larger out-turn of good bricks. With careful management and strict attention to the Brick Fields there is no reason why all the brick-work should not be finished at the end of 1860. The stock of bricks in hand is 7 millions. Six-and-a-half miles of this Division are ballasted, and Permanent Way laid for about 4½ miles, and sufficient ballast is collected for 25 miles more.

Of Permanent Way materials sleepers are delivered for the whole of the main Line, and also for the Monghyr Branch, rails for 8½ miles are delivered, and chairs sufficient for the whole Division.

Tunnel.

The rate of progress in the last six months has not been so good as was anticipated. The "headings," which are in fact large excavations, advanced only on an average of 12 feet a month for both, viz., 4 feet 3 inches per month in the west, and 7 feet 9 inches in the east heading. This slow progress is attributed to the accidental failure in supplies of steel and iron from Calcutta. Assuming that, for the future, there will be an adequate supply of materials in a straightforward work such as this, where no new difficulties present themselves, there is no reason why the progress should not henceforth be at least as rapid as it has been at any time since the commencement of the work. During the early part of this year the headings were advancing at the rate of 16 feet a month, and during the latter part of April at the rate of 19 feet a month. There is no doubt of the practicability of driving these headings at an average of 16 feet a month. The body of the clay slate at the east end was at one time going out at the rate of 20 feet linear, and the body of quartz at the west end at 8 feet a month, but during the last six months they only averaged 15 feet and 4 feet respectively; the progress should be 20 feet and 10 feet respectively. Of the headings there remains only a length of 161 feet, of the mass of clay slate at the eastern end 210 feet, and of the quartz at the western end 400 feet, so that at the above rates, which are only what have been done, not what might be done, in 10 months, or on the 30th April next, the headings should meet, the body of clay slate should be nearly out, and there should be remaining only 300 feet of the quartz rock, which should be worked out in four faces and a road laid through the Tunnel by the end of 1860.

The designs for the Jumalpoor and Monghyr Stations not having yet been sanctioned, nothing has been done beyond the erection of temporary bungalows and the preparation of materials. Considerable progress has been made in these preparatory works.

In anticipation of sanction to the construction of a branch line to the River Ganges at Monghyr, the centre line has been marked out, the working section taken, and the necessary surveys and land plans completed. This branch line is urgently required; its northern end touches the river at the only place where there is deep water throughout the year, and where all the Permanent Way, all the heavy machinery for the work-shops, all the heavy iron-work of the Keeul and Hullohur Bridges must be landed.

Keeul Division, 7½ Miles.

The earth-work on this length from several causes, but chiefly from the competition for labour, has not made satisfactory progress in the last six months. With proper management, however, there is no doubt that the whole may be finished before the close of 1860; an average quantity of 1,000,000 cubic feet a month would more than effect this result.

Of the total amount of brick-work, 1,100,000 cubic feet, there have been executed 336,906 [*P. W. Dept.*] cubic feet, or 31 per cent. of the whole, leaving 763,094 to be done, of which no less than 524,425 are in the Keeul Bridge. Of this large work, which consists of nine spans of 150 feet each, the east abutment and the well foundations for six of the piers are in progress, two of the pier foundations and the west abutments are not commenced, except the excavation for the latter, which is nearly completed.

There is a stock of ballast on hand amply sufficient for the whole of this Division, though none is yet spread.

Of Permanent Way there is none laid; there is a sufficient quantity delivered of rails, sleepers, chairs, but no fish-plates and bolts.

The Keeul Bridge will be the last work to be completed; all the rest of the brick-work should be done by the 30th June 1860. Of the Keeul Bridge it is not probable that the eastern abutment will be finished soon enough to allow an advantageous commencement to be made during the next dry season in fixing the iron girders, that operation should consequently be delayed till after the rains of 1860.

The speed with which the erection of the nine spans of 150 feet girders should be urged depends on the progress of the Hullohur Division adjacent. As that Division cannot be completed before June 1861, it would not probably be worth while to incur any increased expense for plant in urging on the erection of the girders, but we should calculate on that operation occupying most of the dry season of 1860-61, during which time also the Station buildings at the Keeul should be constructed. The whole would even then be finished before the Hullohur Division. The pumping engines, so long wanted at the Keeul Bridge Works, have not yet been dispatched for want of the means of transport. Unless these and other apparatus are received in time, the progress above indicated as probable cannot be realized.

Hullohur Division, 14 Miles.

The total quantity of earth-work being 59,000,000 cubic feet, and the quantity executed being 27,668,000 cubic feet, it follows that there has been completed 47 per cent., and that there remains a balance to be executed of 31,332,000 cubic feet. The last rate of progress in June was about 1,000,000 cubic feet a month and 250,000 cubic feet in excavation of foundations. Assuming that the rate could be increased to 1½ millions a month for eight months, and half that for the other four months, which is probable, we should have 15 millions for a year's work. At that rate the earth-work, or at least sufficient for a single road, would be thrown up by July 1861.

The embankments are already so far united across the flooded lands as will prove, experimentally during the floods of this season, whether the allotted water-way is sufficient. If there is an average flood over the low lands, this very important question will be finally set at rest.

The total quantity of brick-work is 2,240,000 cubic feet, of which 133,700, or 6 per cent., are executed, leaving to be done a balance of 2,106,300 cubic feet. This has always been the most backward and most difficult part of the works on the whole line of Railway. There is much difficulty in obtaining labour, the country is thinly populated, and as it is annually submerged to a considerable depth, and for a breadth of 10 miles through the whole extent of which the Railway passes, the difficulty of transport of materials in the shape of timber, fuel, lime, &c., is great. Consequently the prospect of completing a large quantity of brick-work at an early date was at first by no means encouraging. Now, however, with one or two provisos relative only to the transport of

[*P. W. Dept.*] materials and plant, which ought not to be permitted any longer to delay the work, it may be assumed that the difficulties here are in a fair way of being surmounted. It would be out of place to describe here all the details of the arrangements made and being made for these works. It may be mentioned, however, that for the remainder of the brick-work about 42 millions of bricks are required, of which nearly 11 millions are already on the ground, leaving a balance to be provided of 31 millions. The fuel for burning these is partly wood fuel and partly coal from Kurhurbalee. Of the former a large stock is already on the works, and a large quantity ready to be brought to the works, and after December next the whole supply of the Kurhurbalee Field can be devoted to this part of the Line, so that there seems no probability of delay from want of fuel. Nor will there be any difficulty in getting the required quantity of bricks moulded; it is the remainder of the process which in that locality so many casualties and contingencies may interrupt. To produce the necessary total of good building bricks 200,000 must be put into kiln every day for two seasons. Although the amount of brick-work actually done is small, yet the rate of progress has been gradually, steadily, and, within the last two months, rapidly increasing.

The Hullohur Bridge will have four iron spans of 150 feet each, with brick piers and abutments standing on brick wells.

It is a work of some difficulty, the river being about 600 feet wide with about 16 feet of ter at the dryest season, the bottom consisting of soft mud. No good solid foundation is to be t with unless at a great depth, while the banks and the adjacent country are annually sub- rged to a depth varying from 5 to 10 feet. The wells of the first pier are built up 16 feet d are sunk from 14 to 18 feet below lowest water level; the second pier is not begun. The lls of the third pier are built up 16 feet and sunk 12 feet 6 inches below lowest water level. e progress next season will entirely depend on pumping power. Assuming that the engines d pumps are sent up in time, the three piers may be completely founded on their wells and ilt up above low water level before the rains of 1860. As regards the abutments, it is possible at, with ample pumping apparatus, of which a stock is in hand waiting for transport up the er, they may be founded without the tedious and costly process of well sinking; but without gines and pumps the attempt will not be made. If these abutments can be founded, the n-work may be set in place during the dry season before the rains of 1861.

There will be no delay on account of ballast in this Division; there is already a stock on nd sufficient for 8 miles to the full depth required.

Of Permanent Way sleepers are delivered sufficient for the whole length, but only about mile of rails. A full supply of rails would greatly facilitate the works by affording means of ding materials along the Line in trucks, and so leave the limited supply of country carts for e conveyance of materials to the works from a distance.

From the above it will be gathered that without any extraneous aid, that is to say, without taining supplies of bricks or other materials from other parts of the Railway, provided always at the pumping engines and mortar-grinding machinery are forwarded so as to be available r use during next dry season, the whole of this Division may be completed and ready for ening before the close of the year 1861. To accomplish this result, however, excellent anagement and unremitting attention will be required.

Barrh Division, 31½ Miles.

The total of earth-work amounts to 73,739,000 cubic feet, of which 67,527,000, or 92 per nt., are finished. The entire completion of the earth-work was only prevented by the unusually rly setting in of the rains, and by the sickness prevalent among the labourers.

The brick-work on the main Line is completed; about 2¾ millions of bricks are in hand which may be used in Station works, or, if Permanent Way materials were forthcoming, might be sent on to the Hullohur Division. [*P. W. Dept.*]

About three-fourths of the whole of the ballast is on the ground, and the remainder, it is expected, will be provided during next working season.

Sleepers are delivered sufficient for a length of 25 miles, but there are only rails on the works for a length of 3½ miles.

The completion of this Division depends entirely on the time when the rest of the Permanent Way can be sent up from Howrah.

The large Station at Mokameh and the smaller one at Barrh will be proceeded with, and probably completed, during next working season.

Patna Division, 31½ Miles.

The whole of the earth-work on this Division, amounting to an aggregate of 61 millions of cubic feet, is finished. Of this quantity no less than 12 millions were executed during the last six months.

The total amount of brick-work, exclusive of Station works, is 2,250,000 cubic feet. Of these 1,800,000, or 80 per cent. of the whole, are completed, leaving a balance still to be done of 450,000. Seeing that no less than 1,123,000 cubic feet of brick-work were built in this Division during the last six months, the early completion of the remainder may confidently be expected more especially as all the difficulties of foundation work have been surmounted.

The Poon-Poon Bridge, consisting of nine arches of 40 feet span each, is entirely finished.

The state of the Line as regards the Permanent Way is as follows:—

2½	Miles	Permanent Way laid.
10	"	ballasted and ready for Permanent Way.
13	"	ready for ballast, and ballast on the ground.
6	"	in hand, trimming and dressing, and will soon be completed.
31½	Miles.	

There are now on the works sleepers sufficient for 20 miles, rails for 15 miles, keys for 26 miles, and other fastenings for the whole length.

The progress and present condition of the works on this Division are very satisfactory. If Permanent Way be supplied at an early date, the Line might undoubtedly be opened on the 1st January 1860.

Soane District, 78½ Miles.

The works on this District are under contract to Messrs. Burn and Co., and in this respect are exceptional, as on all the rest of the Line, from Burdwan upwards, the works are carried on by the Railway Company's Engineers.

The total quantity of earth-work is 153,495,000 cubic feet, of which 140,018,000, or very nearly 90 per cent., is completed, leaving a balance to be done of 13,477,000 cubic feet.

The total quantity of brick-work being 6,700,000 cubic feet, and 4,053,000 being built, it follows that 60 per cent. is executed, leaving to be executed a balance of 2,647,000.

[*P. W. Dept.*] Of 12,671,000 cubic feet of ballast required 8,000,000, or 63 per cent., are either spread on the embankments in place, or collected ready for spreading.

The amount of brick-work executed during the last six months has been 1,793,500 cubic feet; the greatest amount for any one month was executed in May last, when no less than 456,000 cubic feet were accomplished.

An accurate idea of the state of the works may be obtained from the following brief Statement:—Of the 78½ miles 45 are quite ready for the Permanent Way. Of 240 Bridges and Culverts 112 are finished, 100 are in progress, and 28 not begun. Of those not begun most are small, and all can easily be finished during the next season.

The Kurrumnassa Bridge consists of 13 arches of 40 feet span each. All the piers and abutments are founded and the work built up above low water level, so that there will be no obstacle to the completion of the Bridge during the next season.

The stock of bricks on hand amounts to about 18 millions, which will be sufficient to keep the works supplied until next season's produce is available.

The want of Permanent Way materials is now, as has been so frequently repeated with reference to other Districts, the great hindrance to progress.

Sleepers for 23 miles, rails for 8, and chairs, keys, fish-plates, &c., for about 30 miles are delivered.

From the above details it will be concluded as a natural inference that the whole of the works should be completed on this District about the end of next year, 1860.

This of course is exclusive of the laying down of Permanent Way, which will entirely depend upon the time when the rails and sleepers are delivered.

The Stations are not begun, but it is expected that rapid progress will be made with them in the course of next season.

Soane Bridge, 28 Spans of 150 Feet.

The preparatory works having been, on two several occasions, almost totally destroyed by the mutineers, the works may be considered to have been commenced anew in November 1858. Taking this into consideration, and also the difficulties of conveying machinery or implements from Calcutta to the works, the progress during the past six months must be considered satisfactory.

Both of the abutments are founded and the brick-work well advanced. That of the east abutment is carried some feet above the level of highest flood, and so can be carried on uninterruptedly. The circular well foundations for three of the piers on the east side are in progress, the first pier is raised above flood level. Three of the pier foundations on the west side are also sunk and the 19th pier is well founded on the clay under the stratum of sand which forms the whole of the river bed.

The total amount of brick-work is 1,551,000 cubic feet, of which 268,000 is built, or 17 per cent. of the whole. This, however, is not to be taken as any criterion of progress, as the present work consisting of well foundations is the most difficult and tedious part of the whole work.

In the course of the last six months about six millions of bricks have been made, and about 500,000 cubic feet of brick-work executed; nearly one-half of this quantity has been used in building brick-kilns, workshops, and other indispensable temporary works, which are necessarily upon a very large scale; the area covered by the brick sheds alone amounts to 260,000 square feet, or more than six acres.

As these preparations are now nearly completed, it is expected that all the foundations may [*P. W. Dept.*] be commenced in and carried on throughout the ensuing season, and be placed in a state of security before the works are interrupted by the floods of June or July 1860.

It is expected that several spans of the iron-work will be erected in place next season, but in naming a date for the final completion of this Bridge there are very many contingencies to be considered not only as regards the commencement and duration of the floods and the preparation of building materials, but also as to the transport of the iron-work from Calcutta. Assuming that the delivery of the heavy masses of iron-work will be soon commenced and steadily continued, of which, taking into account the assistance which by this time next year will be got from the Railway Company's Steamers, there ought to be an almost certain prospect, that, as four spans have been accomplished in the dry season of 1859-60, the remaining 23 spans can undoubtedly be done in the two succeeding dry seasons, and the Bridge completed for public traffic before the end of 1863.

GENERAL REMARKS.

THE dates when the several Sections of the Line may be completed are set forth in the preceding account of each; it is not necessary here to recapitulate them. With respect to Stations, they are not so advanced as other parts of the works; but the works of the main Line have been intentionally urged on in preference. No delay to the opening of any part of the Line will be due to want of Station accommodation, which will now be the subject of attention, and there is now no reason why the Station works should not be prosecuted with vigour.

With the exception of the Soane Bridge, the Hullohur and Keeul Works will be the last completed. It would be possible to complete them sooner than has been stated, though not except at a very heavy increase of expense; but in completing this, as well as other portions of the Line, it is to be considered whether, having opened a long length of road at the end of 1860, we should be in a position, as regards rolling stock and a working staff to open another long length six months afterwards.

The progress of the brick-work is clearly shown on the accompanying Table C. In round numbers it may be stated that the total quantity on the 416½ miles is 30 millions of cubic feet, of which 8¾ millions were built during the past year; altogether more than 16½ millions are finished, or nearly 54 per cent. of the whole amount required.

STATEMENT A.

EAST INDIAN RAILWAY.

Abstract Expenditure incurred in upholding the Permanent Way and Works between Howrah and Raneegunge, being a distance of 121 *Miles, for* 6 *Months, ending June* 30*th* 1859.

Months, 1859.	Miles.	Engineers' Salaries.			Inspectors' and Plate-layers' Salaries.			Native labour, Sirdars and Coolies.			Gate-keepers.			Materials and Carriage of Do.			Office Establishment.			Sundries.			Total.		
		Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.
January	65,727	1,170	7	3	2,218	0	6	5,577	11	11	658	0	0	22,337	10	5	490	0	0	1,458	10	5	33,904	8	6
February	60,508	1,170	7	3	1,970	14	2	5,823	2	1	658	0	0	2,217	6	10½	490	0	0	708	0	1	13,037	14	5½
March	70,890	1,170	7	3	1,923	9	8	4,668	5	11	658	0	0	5,077	4	3	490	0	0	602	4	9	14,589	15	10
April	66,150	1,170	7	3	1,710	14	0	5,436	9	5	658	0	0	3,012	15	8	490	0	0	1,109	4	0	13,588	2	4
May	66,722	1,170	7	3	1,912	4	10	4,893	13	11	658	0	0	6,312	11	8	490	0	0	1,640	14	4	17,078	4	0
June	69,479	1,170	7	3	1,919	5	6	5,512	8	10	658	0	0	11,788	8	4	490	0	0	2,001	13	9	23,540	11	8
Total ...	3,99,476	7,022	11	6	11,649	0	8	31,912	4	1	3,948	0	0	50,746	9	2½	2,940	0	0	7,520	15	4	1,15,739	8	9½
		Cost per Mile P. 3.37			Do. P. 5.59			Do. A. P. 1 3.33			Do. P. 1.89			Do. A. P. 2 0.39			Do. P. 1.41			Do. P. 3.61			Total Cost per Mile. A. P. 4 7.62 D. Or in English 6¾		

STATEMENT B.

EAST INDIAN RAILWAY.

Statement of Sleepers put into the Road between Howrah and Raneegunge, being a distance of 121½ *Miles, for the six months ending* 30*th June* 1859.

Number of each Material per mile of Single Line.	Sleepers, Sal Creosoted, Fir, &c.
	1,584
1859.	
January	722
February	658
March	898
April	1,192
May	2,068
June	1,047
Total for Six Months	6,585
Average per Month	1,097
Average per Mile per Month	9.02
Average per Mile per Annum	108.24

[P. W. Dept.]

STATEMENT C.

EAST INDIAN RAILWAY.

Statement of Brick-work on the several Divisions of the Railway.

Districts.	Length in Miles.	Total Quantity.	Executed up to the 30th June 1858.	Executed up to the 30th June 1859.	Executed during the year.	Remaining to be executed.
South Beerbhoom	45	50,73,259	32,61,151	40,77,557	8,16,406	9,95,702
North "	33½	22,77,350	7,72,355	17,83,929	10,11,574	4,93,421
South Rajmehal	23½	8,00,000	59,475	6,05,507	5,46,032	1,94,493
Centre "	26	13,65,566	97,912	8,54,287	7,56,375	5,11,279
North "	25	7,12,000	21,009	1,75,442	1,54,433	5,36,558
Peerpoyntee	26	12,00,000	1,24,505	5,32,219	4,07,714	6,67,781
Bhagulpoor	23	20,00,000	1,48,930	7,19,796	5,70,866	12,80,204
Jehangerah	20	10,40,000	... ...	92,595	92,595	92,595
Monghyr	31⅓	1,672,342	1,78,739	6,17,027	4,38,288	10,55,315
Keeul	7⅓	11,00,000	1,97,079	3,36,906	1,39,827	7,63,094
Hullohur	14	22,40,000	9,700	1,33,700	1,24,000	21,06,300
Barrh	31½	3,33,000	65,706	3,32,974	2,67,268	200,56
Patna	31½	30,78,917	3,25,082	18,05,508	14,80,426	12,73,409
Soane	78½	69,59,300	20,98,900	40,52,700	19,53,800	29,06,600
Total	416½	2,99,01,734	73,60,543	1,61,20,147	87,59,604	1,37,81,587

APPENDIX I.

[*P. W. Dept.*]

Progress Report of the Works on the East Indian Railway in the North-Western Provinces from February to July 1859.

Benares District, 50 Miles, and River Branch from Mogul Serai to Benares, 6¼ Miles.

Earth-work.—41,000,000 cubic feet were completed by June 1st with the exception of the Station yards and some approaches to level crossings ; the finishing of which will remain pending the settlement of Station arrangements, &c.

Brick-work.—206,200 cubic feet in Culverts; there are no Bridges of large spans in this District.

Ballast delivered by the Contractors 8,652,800 cubic feet ; 234,000 cubic feet remain to be collected to make up the entire quantity.

The slopes are grassed.

In addition to the contract works, the District Engineer has been engaged upon the preparation of materials for the stations at Mogul Serai, the Benares branch station, and the four small stations of Gahmur, Dildarnuggur, Zumuneeah and Sukuldea. At Mogul Serai station 100,000 cubic feet of brick-work have been built in foundations, and Station Masters' and Engine Drivers' bungalows are built. At the Benares terminal station about 3½ millions of bricks and 10,000 cubic feet of timber are ready; a good bungalow is built.

Designs are in course of submission for modifying the second and third class stations in the North-West Provinces, which remain to be built; the principal features in the proposed alterations being the location of the various buildings so as to render them to some extent defensible, and providing accommodation in the same building for the European staff employed in maintenance and working of the Line ; and so constructing the building as to admit of extension if necessary. The four small stations above named have been commenced but are not being pushed on pending the decision of this question, but they will be ready before the Permanent Way is laid. There is no Permanent Way at present laid on this District.

The failure of the earthen bank and ditch fencing, as originally constructed, on the open line in places where it has been subjected to the action of water, has induced a trial of other descriptions of fencing, and nurseries of suitable plants are now being established.

East Mirzapoor District, 28 Miles.

Earth-work.—The embankment is finished and trimmed except some amount of earth-work at the backings of bridge abutments, and a small bit of bank and cutting near Chunar, which is not quite finished.

The total amount of earth-work executed amounts to 47,000,000 cubic feet. The quantity that remains to be executed is 10,000,000 cubic feet.

The finishing of the diversion of the Howrah Nullah and some road approaches are the principal incompleted works.

The grassing is nearly complete.

The ballast is all collected, the bottom lift is in place.

[*P. W. Dept.*] The following list of the more important Bridges in this District will show the progress that has been made :—

List of Bridges on East Mirzapoor Division.

No.	Chain.	Description.	Completed.	Not completed.	TOTAL.	REMARKS.
1	191.00	One 20 Arches.	14,721	301	15,022	
2	858.00	One 20 "	12,480	80	12,560	
3	Kulkulea ...	Three 50 "	119,397	19,846	139,225	
4	Jurgoo ...	Seven 60 "	209,898	67,250	277,148	
5	975.95	One 30 "	34,899	394	35,293	
6	Tammalage.	One 60 / Two 12 "	48,273	17,992	66,265	
7	1072.97	One 25 "	32,267	2,295	34,557	
8	1085.76	One 20 "	15,675	1,481	17,156	
9	Doe Valley.	Five 30 "	79,746	24,939	104,685	
10	1100.18	One 30 "	37,821	10,205	48,026	
11	1194.06	One 25 "	17,962	1,655	19,617	
12	1133.50	One 40 "	38,619	10,000	48,619	
13	1167.40	One 25 "	36,273	2,037	38,310	
14	1245.05	Five 20 "	36,690	4,896	41,586	
15	1257.25	One 25 "	17,014	1,404	18,418	
16	1290.30	One 30 "	26,916	1,851	28,767	
17	1311.75	Three 20 "	28,312	16,576	44,888	
18	Kowah ...	Three 30 "	61,868	31,874	93,742	
19	1435.70	One 60 "	45,853	28,066	73,919	

The Kulkulea is the first in the list deserving of special notice. It consists of three arches of 50 feet span. The centres were struck most successfully on the 2nd of March. There only remains now some spandril and parapet walling to complete this Bridge.

The Jurgoo Bridge, of seven arches of sixty feet span, is the next large work. The sinking of the walls for foundations terminated at the end of March, and from that date the progress has been most rapid and satisfactory, three arches have been keyed, and a fourth is nearly ready for keying. In spite of the very heavy floods the timber work of the centres for the remaining arches is being fixed with all despatch.

The Tummalgunge Bridge.—The arching was commenced the last week in February. The centreing was struck on the 29th of March.

The Doe Valley Bridge.—Three arches and a half are turned, and the work is being carried on with energy. [*P. W. Dept.*]

Bridge at 1245. Ready for the parapet.

Bridge at 1311-75. The three arches will be finished by the end of July.

Kowah Bridge.—The work at this Bridge has been for some time at a stand still to admit of the labour being concentrated on the heavier works. The masons resumed work early in July, and the work will be pushed forward.

Bridge at 1435.—As soon as one of the Jurgoo centres is at liberty, which will be about 15th August, it will be sent up to turn the arch of this Bridge.

The total cubic quantity of masonry in this Division is	cubic feet	1,302,860
Of this there has been done	"	1,044,615
And there remains to be executed	"	258,245

Middle Mirzapoor District, 32 Miles.

The earth-work in embankments is finished and some portion of the trimming and grassing done.

The total quantity executed is	59,000,000
There remains to be done	5,791,000

The principal portion of this is in level crossings and backings to Bridges, &c.

The ballast is nearly all collected and the bottom lift spread; about 870,000 cubic feet remains to be collected out of a total of 5,472,000.

There are 7½ miles of Permanent Way laid in this Division, but no more is being put in as this length is sufficient for the Contractor's requirements.

The list of large Bridges in this District and their present condition is as follows:—

Bridges in Middle Mirzapoor Division.

No.	Chain.	Description.	Completed.	Not completed.	Total.	Remarks.
1	Bulwun ...	Eight 60 Arches ...	277,208	252,984	530,192	
2	1893.00	One 80 Iron girders.	49,052	1,374	50,426	
3	Kudjoura ...	Three 80 "	83,796	11,134	94,930	
4	Oojhlah ...	Three 60 Arches ...	170,079	9,536	179,615	
5	2308.60	One 25 "	14,398	.....	14,398	
6	Kurnoutee...	Five 60 " .	189,897	71,469	261,366	

[*P. W. Dept.*] *The Bulwun Bridge* of eight 60 feet arches is in a forward state. The centres of five of the arches are in and the turning of the arches has commenced.

The single 80 feet span with iron girder at chain 1893 and the Kudjoura Bridge of three 80 feet openings with iron girder are both ready for the reception of the iron-work.

There remains some work in the wing walls in each Bridge.

The Oojhlah Bridge of three 60 feet spans is in a forward state, and nothing but the parapet is wanting to complete it.

The Kurnowtee of five 50 feet arches. The piers and abutments are ready for the arches, the centres are being fixed in place, the arch stone is nearly all ready and will be rapidly set when once the turning of the arches is commenced.

Total masonry on this Division	Cubic feet	1,386,173
Quantity executed	"	1,026,679
" to be executed	"	359,494

West Mirzapoor District, 31½ Miles.

The earth-work executed amounts to 57,000,000 cubic feet; there remain to be done 6,500,000 cubic feet, principally in the high bank on the south approach to the Jumna River.

The ballast collected amounts to 3,320,000 cubic feet, and 1,830,000 cubic feet remain to be collected.

The collection of ballast throughout the whole Mirzapoor District from Mogul Serai to the Jumna is comparatively easy. There is no Permanent Way laid in this Division.

The following is the list of Bridges in this District :—

List of Bridges in West Mirzapoor District.

No.	Chain.	Description.	Completed.	Not completed.	Total.	Remarks.
1	3314.00	One 20 Arch.	17,490	.....	17,490	
2	3761.00	One 20 "	16,961	7,791	24,752	
3	3872.00	One 20 "	30,103	4,933	35,036	
4	Tonse ...	Seven 150 "	.....	.....	1,487,996	
5	4058.00	One 20 "	8,577	1,069	8,646	
6	4467.00	One 40 "	38,606	.....	38,606	
7	4834.00	Five 40 "	60,904	86,341	147,250	

The Tonse Bridge.—Seven spans of 150 feet is the most important work in this Division. Piers Nos. 1 and 2 nothing done.

Pier No. 3 well sinking commenced	April 5th.
Work stopped by flood	June 6th.
Total depth sunk	10 feet.

[*P. W. Dept.*]

Pier No. 4 commenced	February 22nd.
Stopped	June 5th.
Total depth sunk	13 feet.
Pier No. 5 commenced	December 22nd 1858.
Stopped	June 5th 1859.
Total depth sunk	20 feet.
Pier No. 6 commenced	December 1st 1858.
Stopped	June 5th 1859.
Total depth	29 feet.

Large quantities of rubble stone are on the ground and a considerable quantity of large sized stone for covering the wells is now in course of delivery. Sal wood for piling for the abutments is on the ground.

The Bridge of five 40 feet spans in the bank on east side Jumna Bridge approach is nearly up to springing. When the centres are released from the eastern Division of Messrs. Hunt and Emsley's contract, the turning of the arches will be commenced.

It is proposed to postpone the laying of the Permanent Way from the Kurrumnassa to the Jumna until the line is open from Allahabad to Delhi.

The total of brick-work and masonry on this Division amounts to	Cubic feet	521,900
Of this amount there is complete	"	275,132
And there remains to be done	"	246,768

exclusive of the Tonse Bridge work.

No exertions have been spared by the Contractors, and handsome rewards have been held out by them to the successful members of their staff. The energy and tact of Mr. Spencer, Resident Engineer, and Mr. Brundell, Assistant Engineer, have contributed much to the great progress in the Bridge works in the East Mirzapoor Division.

The conduct of the work has been in every respect most satisfactory. It is to be regretted that ill health, brought on by over-exertion, has compelled Mr. Emsley to leave India for a short period.

Jumna Bridge, Allahabad.—15 openings of 205 feet each.

The sinking of the twelve foundation wells of No. 13 Pier was stopped on the morning of the 6th June; they had then sunk to an average depth of 43-29 feet, and to a depth below low water of 41-17 feet; the wells have been filled with a stratum of concrete eleven feet thick above the curbs.

Pier No. 12.—The wells in this Pier had been sunk on 4th June to a depth of 28-04 feet. These wells would have been sunk to the same depth as the wells in No. 11 Pier had it not been for the obstacles presented by an irregular and very stiff bed of clay which caused the sinking to proceed with difficulty. The Resident Engineer resorted to numerous ingenious expedients to overcome the obstruction, and before the close of the season he had succeeded most satisfactorily in getting all the wells into a fair condition for further sinking when work is resumed.

The adoption of helmet diving under the direction of Mr. R. Deane has been most successful. The natives have taken readily to the novel style of work, and now render most valuable assistance on emergent occasions, such as the removal of trunks of trees, pieces of hewn timber, stiff masses of clay, and pieces of carved stone of considerable size, portions of ancient structures which occasionally present themselves. Objects of the above description will be

[*P. W. Dept.*] encountered from time to time. It is not thought that they are the remains of buildings which formerly stood on the Bridge site, but that they have been carried down stream by the current, and are gradually working their way through the super-incumbent silt and loose sand down on to the clay stratum.

The preparation of curbs, and the necessary plant for the next season's work, is proceeding most satisfactorily, new and very extensive brick-fields are being laid out, and there will be abundance of all necessary material for the vigorous prosecution of the works in the coming cold season.

Jumna Dock.—This work is now complete, and the machinery for unshipping Locomotives is all in place, and the engines and other heavy plant are unloaded with facility.

New Wharf attached to the Jumna Dock.—This Wharf consists of aquay wall at a low level and a paved slope from the top of the quay wall to the level of rails at the Jumna Dock, to enable boats laden with rails and other material to be unloaded with facility, irrespective of the height of the water in the Jumna.

The quay wall is built and the pitching of the slope is completed, with the exception of a small portion, where the ground is unsound and has been made up. It is not advisable to pitch this portion until the made ground has had time to consolidate.

Allahabad Station Works.—The brick-work of the Smith's shop is completed and the roofing is progressing.

The coke shed and the water tank building are roofed and the brick-work of the tank is finished.

The trusses of the roof for passenger platform are now being put into place.

Sanction has been obtained to roof the coal store, the trusses of which have been for a long time ready. This building will be of great service as a store, and for the present as a dwelling also. Its position renders it somewhat inconvenient for a coal store.

The walls of the large store-house are about four feet above rail level.

Three large bungalows have been built since last report, and a long range of Barracks with 34 rooms is in course of construction for the Locomotive workmen.

A bungalow for the permanent Plate-layer is nearly ready, as is also one for an Inspector.

The increase of all rates caused by the great demand for labour and materials on the Government works, and also for private undertakings, most seriously affects the cost and period of completion of the very extensive works at this station.

New Fort Branch, 3 Miles.

Complete and in good working order.

Lower Futtehpoor Section, 60 Miles.

The Permanent Way is in excellent order notwithstanding the very heavy rains. Some cutting on the edges of the bank has taken place and the earthen fence in some portions has been much destroyed. This fence stands well where the soil is not very sandy and the grass has taken root, but in low lying ground it has failed completely and some other system must be adopted.

The Engineer's attention is directed to the selection of a proper substitute.

The gates, signals, scotch blocks, &c., are all complete (except some trifling fixtures) with the exception of painting.

The minor stations want merely some trimming up to complete them. [*P. W. Dept.*]

At Berhampoor the passenger station is completed, except painting.

The trusses for the roof of passenger platform are being put up.

The engine stable is ready for the roof.

Barracks and out-offices for European workmen, Station Master, and Telegraph Clerks are finished, and also small buildings for the Locomotive Native Workmen.

Upper Futtehpoor District, 58¾ Miles.

The level crossings have been made and the lodges are being constructed, the gates are all made and are ready for hanging as soon as the heavy rains moderate.

On this District the same remarks as to fencing apply as on Lower Futtehpoor District.

The stations at Futtehpoor, Malwah, Mohar and Sirsoul are complete with the exception of some joinery work in the fixtures.

The up-platforms and waiting sheds at Futtehpoor and Mohar are completed. At the intermediate stations of Malwah and Sirsoul the foundations only of these platforms are constructed, as there is no present occasion for their completion.

Iron piping and a water crane are to be adopted for the up-watering arrangement, thereby obviating the necessity for a second well and bullock run at each station.

The embankment and road generally are in a very good condition, and no slipping or subsidence has occurred, although the rains during the present monsoons have been exceedingly heavy and continuous.

Cawnpoor Station Works.

The works at this station are in the following position:—

The passenger station is finished, with the exception of a portion of flooring, a small part of the roof of the platform shed, and the fixing of the doors, which are all ready.

The carriage repairing shed is complete. The coal and water shed also complete, with the exception of the pumping apparatus and piping.

The Resident Engineer's and Locomotive Superintendent's houses with offices and out-buildings are finished.

Three bungalows of six rooms each for Drivers and Foremen are complete, and a fourth is nearly ready.

Eight cottages, containing six dwellings each, for native workmen are finished.

An Inspector's bungalow on site of a former house is fully repaired. The wood store and temporary traffic shed are finished.

Locomotive Foreman's bungalow with out-offices is also finished.

The Drainage system is being carried out, and also the trimming and laying out of the station approaches.

The building of the circular engine shed has been in abeyance, pending the finishing of the more urgently required works.

Cawnpoor District, 26½ Miles.

The bank is ready throughout the whole of this District except the backings of the Rhind Nuddee Bridge.

[*P. W. Dept.*] The full quantity of ballast is collected, sleepers are laid out on the Line for 15 miles and the sleepers for the remaining 11½ miles are ready at a Canal Ghat on the Division.

The Rhind Bridge, three 60 feet spans, is ready for the arching, but it is prudent to wait for the subsidence of the water. The arches will be commenced in about a month, and will occupy about three months in completing.

The plate-laying will commence immediately after the rains, with every prospect of being successfully carried out.

The small station of Bhowpoor is the only station on this Division, the well has been sunk and the materials are all prepared. The building work will not occupy much time.

Nurseries for fencing plants are in preparation.

Etayah District, 92½ Miles.

The whole of the earth-work is complete, except some 300,000 cubic feet, and ready for Permanent Way.

Ballast 338,000 cubic feet have been collected during past half-year, and but little more is required to complete the full quantity.

The masonry of all the Bridges and Culverts has been completed, with the exception of two small Culverts and some coping to some of the small Bridges, and backing to the Canal Skew Bridge at Roora. 4,700,000 bricks have been made during the last half-year. The brick-work of the small station will keep pace with the plate-laying. Sleepers are stacked along 22½ miles of the line. A quantity sufficient for 20 miles more is at the Canal Depôt, and a sufficient quantity in stock at other points to ensure no delay to plate-laying operations.

The works generally are in such a position that the plate-laying will regulate the completion of the whole to Etayah.

Agra District, in all 86¼ Miles.

The earth-work from the commencement to the site of the Agra Junction is all completed with the exception of the gaps at the sites of four small Bridges.

Two small Bridges of 12 feet span each and one of 20 feet span have yet to be built, but the materials are all on the ground.

The Agra Branch, 12¾ Miles.

The bank is all finished with the exception of the 700 feet of embankment across the Jhirna Valley and the approach to the Agra Terminus.

The ballast for 35½ miles of the east end of this District including the Agra Branch is all collected for a single line upon 24½ miles, and on the remaining 11 miles more than sufficient for the first lift is on the ground.

The condition of the Bridges on this length is as follows:—

No. 1.—A 20 feet Bridge is not commenced.

No. 2.—The 80 feet Bridge over the Huyatpoor Nulla is finished up to springing, and bricks for the arch are ready.

No. 3.—20 feet Bridge finished.

No. 4.—A 25 feet Bridge is up to springing, and materials all ready to complete.

No. 5.—A Bridge of three 30 feet arches finished all but the parapets.

No. 6.—A 30 feet Bridge. The foundations are all in and materials on the ground sufficient to complete the work.

No. 7.—The Jhirna Nullah Bridge, 90 feet span. The foundation wells for the east abutment are sunk to a depth of 14 feet, they will require to go considerably lower; the west abutment, a good stiff clay bed at an average depth of 20 feet, furnishes a good foundation, and the wells for this abutment are closed over and about two feet in height ot the neat brick-work is built. [*P. W. Dept.*]

No. 8.—A 20 feet Bridge is nearly up to springing.

The smaller Bridges and Culverts are all finished.

The preparation of materials for the Etmadpoor Junction and the Agra Terminus is progressing; the plans of this station and the Etmadpoor Junction will shortly be submitted for sanction.

From Etmadpoor to Allyghur the setting out of the side widths is progressing. The construction of this portion of the line will be attended with but little difficulty.

A contract for the delivery of 100,000 sleepers on this District is being carried out; and every provision will be made to complete the requisite number before the arrival of any iron Permanent Way materials.

Delhi District, 84 Miles.

The setting out of the side widths and the preparation of land plans is being carried on satisfactorily. Two Inspector's bungalows and some staging bungalows are completed. A large house at Allyghur has been purchased for the use of the Railway Staff, and it is now being put into complete repair.

The position of the proposed line, from the 65 miles to Delhi, with the proposed Hindun River crossing and the site for the Delhi Jumna Bridge were submitted for the sanction of Government on the 16th July.

The borings in the Jumna do not give very promising results, but the proposed abutment sites are most favourable.

Borings are being carried on at the Hindun crossing.

The Fort of Selimghur has been made over to the Railway Company for a store-yard, and site for bungalows and the collection of materials, timber, fuel, &c., is proceeding most satisfactorily.

A free passage across the Jumna Bridge-of-Boats for all Natives and Europeans employed on the Jumna Bridge Works has been accorded by the Punjab Government.

The necessary preliminary surveys, &c., for deciding the position of the Delhi Terminus are being carried out.

Nurseries for fence plants are in preparation.

It has been decided that the Permanent Way, which is expected to arrive at Allahabad in large quantities during the cold season of 1859-60, is to be devoted exclusively to the line beyond Cawnpoor; all preparation as to sleepers, ballast, &c., are in a most forward state, and, when the rails are laid on the Cawnpoor District, the Jumna Branch of the Ganges Canal will be used to push rails up towards Etayah, and so work from both ends of the line.

Sutlej Trial Works.

The trial works at Hurreekee Puttun were resumed in October 1858, and borings were taken at intervals of 500 feet on the proposed centre line. Twenty borings were taken, three of them in the Channel of the river. The clay bed noted in the first report was found to

[*P. W. Dept.*] extend across the whole width of the stream, except in two cases where 36 feet of sand was bored through without meeting with clay. The clay appears at an average depth of 13 feet below low water, and its mean thickness is 14 feet.

The whole course of the Sutlej from Loodiana to Hurreekee Ghat was examined to ascertain if there was any point in the course of the stream which offered peculiar facilities for bridging anywhere above Hurreekee, but the River Sutlej is throughout this part of its course unconfined by any solid banks, and extends its Channels over a wide tract.

:CHANDIZE TRAFFIC	C.						D.	
	Ordinary Goods.							
l.	Public.		Railway.		Total.		Receipts from Sundries.	Grand Total.
Receipts.	Quantity Maunds.	Receipts.	Quantity Maunds.	Receipts.	Quantity Maunds.	Receipts.		
Rs. A. P.		Rs. A. P.		Rs. A. P.		Rs. A. P.	Rs. A. P.	Rs. A. P.
6,269 11 11	2,96,622	71,404 10 0	1,56,234	30,765 15 11	4,52,856	1,02,170 9 11	11,697 15 7	6,06,867 12 11
8,518 6 2	4,22,340	1,08,059 12 10	1,89,184	40,013 9 10	6,11,524	1,48,073 6 8	9,768 6 0	6,81,134 9 5
8,692 6 9	3,43,677	82,884 7 8	1,05,995	10,664 14 8	4,49,672	93,549 5 11	904 5 6	4,21,231 7 4

APPENDIX J.

EAST INDIAN RAILWAY, BENGAL SECTION.

Comparative Statement of Traffic for the Quarter ending 31st July 1859.

[P. W. Dept.]

Length of Line open.	Period.	COACHING TRAFFIC A.								B.		MERCHANDIZE TRAFFIC C.								D.	Grand Total.
		Passengers.										Minerals.				Ordinary Goods.					
		First Class.		Second Class.		Third Class.		Total.		Receipts from Parcels, &c.	Total Receipts from Coaching.	Receipts from Special Trains.	Public.		Railway.		Total.		Public.		Railway.		Total.		Receipts from Sundries.	
		No.	Receipts.	No.	Receipts.	No.	Receipts.	No.	Receipts.				Quantity Mands.	Receipts.	Quantity Mands.	Receipts.	Quantity Mands.	Receipts.	Quantity Mands.	Receipts.	Quantity Mands.	Receipts.	Quantity Mands.	Receipts.		
Miles.			Rs. A. P.		Rs. A. P.		Rs. A. P.		Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.		Rs. A. P.		Rs. A. P.		Rs. A. P.		Rs. A. P.		Rs. A. P.		Rs. A. P.	Rs. A. P.
142	Quarter ending 31st July 1859 ...	2,462	9,990 12 11	14,149	23,402 8 1	2,21,353	1,57,758 2 11	2,38,454	1,91,150 7 0	30,370 15 6	2,21,520 7 6	800 0 0	1,15,946	2,27,121 0 4	2,25,857	35,198 5 7	1,50,759	2,62,319 5 11	2,90,522	71,404 10 9	1,50,294	20,705 15 11	4,52,816	1,02,110 3 11	13,662 15 7	4,06,967 12 11
142	Previous Quarter	2,753	14,764 12 4	14,245	22,510 6 10	2,19,967	1,56,284 0 4	2,47,765	2,03,575 2 10	32,858 12 5	2,70,934 0 3	3,869 15 4	1,11,151	1,84,235 9 4	2,06,042	34,332 12 10	1,50,193	2,18,568 6 2	4,22,540	1,09,022 12 10	1,50,194	20,013 2 10	5,72,734	1,29,035 15 8	3,708 5 0	5,03,276 2 0
142	Quarter ending 31st July 1858 ...	2,702	12,212 12 10	13,730	14,754 0 10	2,01,161	1,10,757 12 2	2,26,593	1,37,724 5 0	23,852 13 8	1,67,571 7 0	1,012 12 6	2,45,779	1,13,345 0 11	1,08,205	12,382 12 10	7,53,710	1,25,727 6 9	3,10,366	10,554 14 9	4,49,672	32,240 6 11	7,60,038	1,42,982 5 8	434 2 6	4,31,195 7 4

Comparative Abstract of Earnings per Train Mile and per Mile open for Quarter ending 31st July 1859.

	Total of A. and B.		Total of C. and D.		Grand Total.	
	Receipts per Train Mile.	Receipts per Mile open.	Receipts per Train Mile.	Receipts per Mile open.	Receipts per Train Mile.	Receipts per Mile open.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Quarter ending 31st July 1859 ...	4 2 10	1,608 9 10	2 8 02	1,010 0 07	3 11 10½	2,594 9 5.4
Previous Quarter	4 3 03	1,646 11 06	4 10 10	1,901 12 10½	4 12 10½	3,551 11 10½
Quarter ending 31st July 1858 ...	3 11 07	1,497 1 06	2 7 02	1,016 2 10½	3 11 10	2,513 3 10½

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CALCUTTA, JANUARY 1860.

REPORT

OF

PROCEEDINGS

IN THE

PUBLIC WORKS DEPARTMENT,

During the Official year 1859-60.

134483

REPORT

OF PROCEEDINGS

IN THE

PUBLIC WORKS DEPARTMENT,

DURING THE OFFICIAL YEAR 1859-60.

1. THE chief matter of a Report of Proceedings in the Public Works Department should undoubtedly be actual progress in the works which are the end of its existence, and not a mere re-capitulation of measures of Departmental Administration.

2. There has been great difficulty hitherto in obtaining all the Local Reports which must form the basis of such a review of progress in good time; and there is little encouragement to enter into an elaborate analysis of a state of progress which already belongs to the past. There are real difficulties in the way of obtaining such timely Reports, arising not merely from the vast extent of territory to which they refer, and the great number of subsidiary Reports which must be reviewed, analysed and compacted by each Local Government, to be submitted at Calcutta, and again compacted into one general Review for all India from Peshawur to Singapoor. The progress of one great work, a Canal or a Railway, can be shown by a concise descriptive statement. But progress in a system embracing many large works and an infinity of small works to be at once comprehensive and intelligible can only be shown by figured Statements exhibiting the money expended under different heads during the term reviewed.

3. And indeed the yearly Progress Reports of the Department are necessarily of a financial character, as the correlative at the year's end of the Departmental Budgets which lay down the scheme of operations at the beginning of the year. It is this financial character of the Progress Reports which renders early completion most difficult, and some modification of the nature of the Report seems necessary to secure a review which shall not relate to comparatively obsolete matter. This may be either by the acceptance of approximate returns of expenditure framed before the end of the year, or by a separate submission of a Statement of progress, properly so called, on works of importance only, in anticipation of the complete financial detail of the expenditure. This will be considered. It should be acknowledged however that the present compilation might have been ready earlier had not the pressure of daily business and the separation of the Office during the Viceroy's tour further retarded it.

[*P. W. Dept.*] 4. The Statement of expenditure in the year under report is shown in a classified Tabular Sheet at the end of this document (Appendix I.) The prominent feature in it is the excessive predominance of expenditure on Military works. The whole aggregate being Rs. 3,22,21,675, of this amount Rs. 1,23,94,670 has been expended on Military and Naval objects, including a sum of Rs. 86,918 for "Military Contingencies," (or that portion of the expenditure on Barrack furniture, conservancy, &c., which has passed through the P. W. Accounts); Rs. 23,87,391 has been expended on other "State" objects; and Rs. 1,07,74,545 on "Internal Improvement;" whilst the cost of Establishments and Contingencies has been Rs. 66,65,069. Or, distinguishing between Original Works and Repairs, the general result may be thus exhibited :—

	Original Works. Rs.	Repairs. Rs.	Rs.
Military and Naval	1,06,82,379	16,25,373	
Other State Works	15,05,227	8,82,164	
Internal Improvement ...	39,80,279	67,94,266	
	1,61,67,885	93,01,803	2,54,69,688
Military Contingencies			86,918
Establishments and Contingencies, (Travelling Allowances, &c.)			66,65,069
Grand Total ...			3,22,21,675

5. These are not proportions which it is satisfactory to contemplate, and they contrast painfully with the relative proportions before 1857. But there is every ground to believe that they will also contrast very unfavourably with the results of the year now passing away, and if continued peace be granted, of that which is coming. There is a good deal still to be done both for the comfort of the Troops and for the Military security of the country. But it is to be hoped that it will be done cautiously, with time for circumspection, and on a permanent determination of the Forces and their disposition, and no longer under heavy pressure, detrimental to all economy, and exacting work at all costs to meet requisitions the object of which, however apparently urgent at the time, often proved to have no durability.

6. The following is a list of some of the most important items which contribute to the totals in the classified Abstract :—

MILITARY.

		Rs.
Madras.	Barracks at Jackatalla (now Wellington)	4,23,691
	Improvements to Barracks in Fort St. George... ...	63,013
	Barracks at Bangalore	1,26,260
	Fortifications of Fort St. George	1,28,186
Bombay.	Temporary Infantry Barracks at Ahmednugger ...	1,03,401
	" " Ahmedabad	95,661

		Rs. [*P. W. Dept.*].
	Permanent Infantry Barracks at Mhow	1,11,424
	" " Indore	43,099
	Infantry Barracks at Nusseerabad	60,025
	Cavalry " "	43,293
Bengal.	Alterations to Hospital, Chinsurah	47,402
	Temporary Barracks at Darjeeling	65,800
	Iron-framed Barracks at Dehree	1,44,291
	Additions to roofs of Temporary Barracks at Barrackpoor	48,878
	Ordnance Buildings at Ishapoor	50,085
	Constructing Upper Story to Barrack, Dum-Dum ...	46,680
N. W. Provinces.	Cavalry Buildings at Muttra	77,243
	Infantry Barracks at Cawnpoor	1,80,218
	" " and Hospital, Bareilly	1,19,950
	Infantry and Artillery Barracks, Futtehgurh	77,938
	Temporary Barracks at Ooraie	94,043
	Accommodation for European Troops at Shahjehanpoor	1,05,233
	" " Gwalior ...	4,75,924
	" " Seepree ...	46,943
	Barrack Accommodation at Goonah	64,745
Punjab.	Improvements in Fort of Akulgurh	44,819
	Buildings for second European Infantry Regiment, Rawul Pindee...	1,81,026
	Artillery Barracks at ditto	35,008
	Iron-framed Barracks at Mooltan	56,365
	" Ferozepoor	1,22,967
	Barracks in the Hill Stations of Kussowlee and Subathoo	58,635
Straits Settlements.	Fort Canning, Singapoor	1,07,391
	Fort Fullerton, "	42,678
Oudh.	Residency Fort defensive works, Lucknow	1,00,475
	Stone Bridge Post	99,377
	Formation of Cantonments at new Military Stations...	1,16,500
	Officers' Quarters, Lucknow	40,507
	Barracks for two Regiments European Infantry at ditto	4,38,400
	Married Men's Barracks at ditto	1,05,401
	Hospital Accommodation for Infantry at ditto ...	97,330
	Cavalry Hospital at ditto	63,500
	Artillery Barracks for 2 Battalions at ditto	1,04,900
	Accommodation for Troops at Fyzabad	1,95,663
	" " Seetapoor	2,34,224
	" " Roy Bareilly	2,15,472
	" " Gondah	2,80,941
	" " Sultanpoor	47,843
Pegu and T. and M. Provinces.	Redoubt at Tounghoo	1,07,200

[*P. W. Dept.*]

		Rs.
	Commissariat Depôt at Thayetmyo	58,247
	" Godowns at Tounghoo	92,570
Hyderabad.	Two ranges Family Quarters for 1st Battalion Royals at Secunderabad	37,518
	Temporary Quarters for 18th Royal Irish	42,047
	JUDICIAL.	
Madras.	Jail and Court House at Salem	23,406
	Jail at Ootacamund for Natives and temporarily for Europeans	26,532
N. W. Provinces.	Collector's Cutcherrie at Cawnpoor	42,378
Pegu.	Purchase of a House in Rangoon for Deputy Commissioner's Court..	88,669
Hyderabad Assigned Districts.	Dharaseo Central Jail	66,107
	Deputy Commissioner's Cutcherries at Sudder Stations.	58,686
	REVENUE.	
Bengal.	New Customs Shed in Calcutta at Export Wharf ...	34,644
	Two Sheds at Export Ware-house	53,257
	New Opium Godowns in Calcutta	60,705
N. W. Provinces.	New range of Offices at Opium Factory, Ghazeepoor..	23,746
	ECCLESIASTICAL.	
Bombay.	Church at Ahmedabad	10,425
	" Hyderabad (Sind)	11,450
Bengal.	R. C. Chapel, Barrackpoor	12,035
N.W. Provinces.	Restoration of Christ Church, Cawnpoor	40,000
Oudh.	Dilkhoosha Cantonment Church	16,041
	GENERAL.	
Madras.	Additions to Government House, Madras	23,657
Punjab.	" Residency, Lahore	17,541
	MUNICIPAL.	
Bombay.	Restoration of ancient hanging Tanks in the Taweela Valley, Aden	80,369
	Condensers at Aden	26,140
	MARINE.	
Bombay.	Harbour Works at Kurrachee	22,799
	Light House at Perim	20,000
	Patent Slip at Dallah opposite Rangoon	17,730

AGRICULTURAL. [*P. W. Dept.*]

		Rs.
Madras.	Subsidiary Works of the Godavery Annicut	65,527
	Ditto Krishna Annicut...	1,20,861
	Re-construction of Pennair Annicut	44,767
Bombay.	Mittrow Canal, Sind	34,691
N. W. Provinces.	Rajbuhas on Ganges Canal	3,03,940
Punjab.	Baree Doab Canal	5,90,362

COMMUNICATIONS.

Madras.	Trunk Road from Cannanore to Mysore viâ Perumbaddy	23,990
	Bridge across the Hindree near Kurnool	21,063
	Navigable Canal from Samulcotta to Coconada ...	38,344
Bombay.	Improvement of Agra and Bombay Road	59,708
	Road over Sukker Pass, Sind	16,355
	Bridge over Fullailee at Hyderabad	25,554
Bengal.	Ganges and Darjeeling Road	96,397
	Deepening the Circular and Balliaghatta Canals ...	58,013
N. W. Provinces.	Improving the Bewah Branch Road	25,399
Punjab.	Formation of Trunk Road between Sutlej and Beas Rivers	92,999
	Lahore and Peshawur Road	1,95,000
Oudh.	Lucknow and Fyzabad Road	18,354
	" Sultanpoor "	32,261

ADMINISTRATIVE PROCEEDINGS.

System of Annual Departmental Budgets.

7. Previous to 1854 the expenditure of the different Governments on Public Works was not based on any matured and systematic review of the wants of the territories under them, or its distribution determined beforehand with any approach to precision. In that year the Budget system was introduced under orders from home. It was not to be expected that so great a change could be ripened at once. The earlier Budgets were very imperfect as true Estimates of the total expenditure, and the rules, which were introduced by the Government of India in some of the succeeding years, tended to exact a greater rigidity of system and amount of forecast than was practical. In 1859 the experience of four years had made all concerned better aware of what was requisite and attainable, and modifications were proposed, which, after a good deal of discussion, are about to take effect now (April 1861).

8. The objects to be attained by the system appear to be mainly two :—

1st. To insure on the part of all the Governments concerned the exercise of foresight and consideration of the claims of different works, where the demands may

[*P. W. Dept.*] be viewed as virtually unlimited, and the supplies to meet them as very rigidly limited.

2nd. To obtain a true Estimate of the Imperial expenditure for the year.

9. To facilitate the first object it was but reasonable that the Government of India should supply to the Local Governments at a sufficiently early period an annual Statement fixing approximately the limits within which the expenditure of each must be confined. No such guide had hitherto been furnished, and in consequence the Budgets received far exceeded in aggregate the resources available. Their amounts therefore had to be retrenched by a summary process, involving a revision of the whole scheme by the Local Governments. This was not only a vexatious inconvenience to them, but caused a loss of valuable labour in the preparation of projects for which funds were not forthcoming.

10. As regards the second object, viz., the preparation of a true Estimate of expenditure for the year, it was obvious that what are called rough Estimates are just as fallacious in the gross as in detail. A really useful Estimate of expenditure over so wide a field as the Indian Empire must be, not a series of guesses, but a deliberate and careful accumulation of all that can be known or anticipated, supplemented by a liberal margin for demands that are unknown. One and by far the larger section of the Estimate would therefore be in full detail with ample proofs of the care and thought with which the Statement of demands for the year had been compiled. The second would be unaccompanied by any details whatever, and in its disposal the discretion of the Local Governments would not, in ordinary circumstances, be interfered with.

11. Some of the expectations from the institution of the Budget system had proved fallacious. It was expected in the first place that a simultaneous consideration of all the large projects of the year would ensure the wants of the empire being brought forward in one combined and consistent view; and in the second, that their consideration in such a form would relieve the Government of India from the distraction and waste of time supposed to be inseparable from the isolated examination at irregular times of numerous projects of a kindred nature.

12. Experience showed that the first expectation assumed a perfection of system which practically is not attainable. It was supposed that all the projects in the year's Budget would be undertaken during the year. But this had never been the case, and there were on the shelves of almost every Government many sanctioned projects, standing over from past years, which had never been begun, and which therefore represented no small amount of wasted thought and labour.

13. The second expectation was entirely delusive. All who had experience of dealing with the Budgets united in preferring the supposed distraction involved in the occasional consideration of separate projects, to the formidable and inconvenient concentration of

labour required in the examination and discussion of the mass of projects brought under [*P. W. Dept.*] review in a Budget.

14. Closely connected with this subject was the limit to the powers of sanction of the Local Governments. Previous to 1855 the powers of the chief Local Governments, including Madras and Bombay, did not extend beyond sanction to a work estimated to cost Rs. 10,000. In that year the limit was extended on the motion of Lord Dalhousie to Rs. 25,000. This limit however was far more narrow than it was desirable to maintain, especially after the establishment of a system under which the limit of the total annual expenditure of the different Governments was absolutely fixed and unaffected by the sanctions which they might give during the year.

15. The three main objects then to be met by a revised Budget system were :—

1st. The utmost practicable exercise of foresight, with a margin for unforeseen wants.

2nd. The separation, as completely as might be practicable, of the detailed examination of the merits of individual projects submitted for sanction, from the financial review of the selection of sanctioned projects intended to be the subject of the year's operations.

3rd. Increase to the powers of the Local Governments within the fixed limits of an annual assignment of funds.

16. These were the main principles set forth in 1859, though they are only now about to come into operation to the full extent intended.

FINANCIAL AND ACCOUNTS.

First Report of the working of the new system of Public Works Accounts in the Punjab Central Office of Account.

17. The Chief Engineer of the Punjab submitted a very satisfactory report on the working of the new system of Public Works Accounts in that Province during the first year of its introduction. It was shown that notwithstanding the confusion that had previously existed, the shortness of the notice ushering in the change, the number of able and experienced officers removed for field service immediately after that notice had been issued, and the delay in transferring stock to the books of the Central Office, the whole of the Accounts for the year 1857-58 had been finally adjusted within ten months of its close, and, but for exceptional delay in two Divisions, the year's operations would have been concluded within six months of its termination. Added to this, arrear accounts amounting to upwards of a crore of Rupees had been adjusted within the same period.

Audit of charges by Commissioners and Chief Engineers.

18. Annexed (Appendix A) will be found a Circular issued to Local Governments, containing the decision of the Government of India as to whether the audit of charges by Chief Engineers

[*P. W. Dept.*] and Commissioners should be final; and as to the mode in which charges so audited are to be exhibited in the Public Accounts.

Budget sanctions for 1859-60.

19. Also annexed (Appendix B) is a Tabular Statement of the Budget sanctions for 1859-60 compared with the extent, population, and revenue of the several Local Governments. This Statement is imperfect, but a more complete and correct Return has since been completed for 1860-61.

DEPARTMENTAL MANAGEMENT AND DETAILS.

Changes in the administration of the Public Works Department in Bengal and elsewhere.

20. It has been found desirable to make certain changes (explained below) in the administration of the Public Works Department in Bengal, the more essential of which have been extended to the North-Western Provinces, and will gradually be introduced into the Punjab and other Administrations with such modifications as local peculiarities render necessary.

21. Prior to the introduction of the changes above referred to, the Chief Officer of the Department held official communication with the Local Government only through its Secretariat.

22. The inconvenience of this arrangement long felt, has been remedied by placing the officer at the head of the Department in immediate communication with the Lieutenant Governor of the Province, in the capacity of Secretary in the Department of Public Works.

23. It may be noticed that the former system resulted in one of two evils: either the Local Government regarding the administration of the Public Works Department as devolving upon it merely in name, made its Secretary, on Public Works questions, a mere channel of communication between its Chief Engineer and the Government of India; or the authority of the Chief Engineer was regarded as a co-ordinate and rival authority intruded into its administration, imperfectly under its control, having a line of action distinct from that of the Local Government, and liable even to adopt a position of passive resistance or positive antagonism.

24. On the other hand, the Chief Officer of the Department acted under very unfavourable conditions. He often had reason to feel that he was not the final exponent of his views, and regarded with dissatisfaction the interposition of a third party between himself and the Local Government as introducing an influence not fully informed on departmental subjects; and it was very apt to happen in such a state of things that the head of the Government or his Secretary had recourse to extraneous and irresponsible advisers on professional questions.

25. Whilst there was no real utility in the interposition of this third party, it [*P. W. Dept.*] involved delay in business and unnecessary correspondence.

26. The change now introduced is calculated to bring the Public Works administration generally more directly under the cognizance of the Government of India. For the local civil secretariat was an official bar between the Chief Engineer and the Secretary to the Government of India in the Public Works Department. Practically every secretary in a great administration, and especially in a department involving so much of preliminary arrangement and of consideration of individual qualification, will be, and ought to be, to a certain extent, a minister; and the practical result of the separation between the local secretariat and the local head of the department was a very large amount of private correspondence on such matters between the Secretary to the Government of India and the Chief Engineer,—a course involving inconvenience, but, under the circumstances, inevitable.

27. Lastly, such a change was absolutely necessary as preliminary to another, essential above all to the effective administration of the Department by Local Governments, viz., the devolution of the control of the departmental staff as regards postings, transfers, punishments, and promotions, on those Governments in substantially the same manner as that of their own civil staff.

28. It can hardly admit of question that the Department of Public Works cannot be effectively worked unless Local Governments be responsible for this as for other branches of administration within their territories. It is neither just nor possible to hold Local Governments so responsible unless they be endowed with such control; and such control could not be justly or effectively exercised except with the aid of an officer who is thoroughly and familiarly acquainted with the characters, qualifications, and capacities of individuals, whilst he is, at the same time, in that immediate and confidential intercourse with the head of the Local Government which, as a matter of fact and experience, cannot co-exist with the interposition of a third party in the capacity of secretary.

29. There was some difference of opinion among heads of Local Governments as to the manner in which the proposed change should be carried out. It was suggested on one hand that in constituting an engineer secretary, the office of Chief Engineer should be abolished; and, on the other hand, that the latter designation might be retained and both offices combined in one individual.

30. The change has been carried out in the latter form. It certainly is a question whether the retention of both functions is necessary. It was the intention, under all circumstances, that the change should be accompanied by an extension of more independent authority and greater responsibility to Superintending Engineers, who would thus become, to a certain extent, Chief Engineers within their own circles, whilst the professional head of the department, under whatever name, whether as Chief Engineer or as Secretary, must always exercise some executive authority. There would therefore be little practical difference whichever of the two proposals was followed, and the latter had the advantage of involving essentially the least sudden change.

P. W. Dept.] 31. Another alteration is that by which the audit and control of the Public Works Accounts is to be removed from the hands of the Chief Engineer and placed under a separate officer, to be called the Auditor and Controller of Accounts. The necessity for this change had been long admitted. Indeed the Government of India had already been driven by circumstances to place the Public Works accounts of certain Local Administrations in the charge of special officers, and the measure had been attended with much benefit. Controllers of Accounts did, therefore, in fact already exist, and it only remained to put them on a permanent footing and to constitute them auditors also, so as to relieve the Chief Engineers of a duty which, if really performed by them, would leave them little time for any other.

32. To the two changes above described has been added, in Bengal, a third, in the form of a large increase in the number of Superintending Engineers.

33. The want of a close and frequently recurring supervision by officers of experience superior to that of ordinary Executives had been one of the great defects of the Department. In Bengal, in which, above all the provinces of this Presidency, locomotion is slow and difficult, the extent of the circles had hitherto been such as to render such supervision altogether impracticable. The location of Superintending Engineers in the centres of their respective circles had been frequently enjoined by the Home Government, but it was no easy matter to determine what, for practical purposes, should be regarded as the centre of one circle extending from Juggernath to the Nepal Frontier, or of another which embraced Assam, Munnipoor, and Arracan, as well as Calcutta.

34. The number of circles in Bengal has been increased from three to seven, and the Government will now have a right to expect a real and practical supervision. Executive Officers in remote districts will not be left henceforward for long periods to their own devices unvisited and unaided, as has too often been the case hitherto.

Relations between officers of the Public Works Department and officers commanding stations.

35. Till a comparatively late period, the manner in which the business of the Public Works Department was transacted, as well as the position of its officers, was somewhat anomalous. The business was disposed of in several Departments of the Government of India; and the officers of the Department, if military, were under the Military Secretariat, and obtained leave, even of a temporary kind, nominally under the orders of the Commander-in-Chief of the Army. There were few civilians in any but very subordinate positions. The works were chiefly military; and the officers, though their position in regard to military authority was somewhat indefinite, were generally treated as under the orders of local military officers.

36. The great extension, however, of civil works which had taken place since 1848-50; the large introduction of civilians into all branches of the Department; the devolution of increasing authority over its operations on Local Governments; the necessity for a single and defined channel of authority and discipline; and the constitution of the Public

Works Department as a separate branch of the administration with a separate secretariat, rendered it necessary to put the position of its officers on a more definite footing; and it was, therefore, authoritatively declared in the Public Works Code of Regulations that the Department was a civil branch of administration and its officers in civil employ. Pains were, at the same time, taken to define the relations of departmental officers to those in military command, and to enjoin upon the former the exhibition of unfailing respect towards commanding officers, and compliance with their wishes when not inconsistent with departmental rules. These relations are, however, of a somewhat delicate kind, requiring tact and sense on both sides, as must always be the case when two departments are constantly in contact. [*P. W. Dept.*]

37. Instances having lately been brought to the notice of the Government of India, in which officers of this Department had been charged with want of respect to commanding officers, or of having come into collision with the military authorities, it was thought desirable to call the attention, both of the officers of the Department and of the Local Governments under which they were employed, to the regulations affecting the relations between officers of the Department and commanding officers, and to the necessity for their strict observance.

38. It was pointed out that a Public Works officer materially prejudiced the service when by any act of his he gave just cause of offence to an officer in military command; that he was bound by the regulations of the Department to comply with the requisitions, and to act in conformity with the wishes, of such Officers whenever he could do so without infringing departmental rules; and that he was required at all times to treat commanding officers with becoming respect. That if he should receive orders which infringe departmental rules, or which, without doing so, still trench on his efficiency in the discharge of his general duties, he should first try the effect of personal explanation, which in nine cases out of ten would remove difficulty; but if this failed, that he should then refer the matter through his departmental superiors to the Government under which he serves, carefully abstaining, meanwhile, from giving offence and from writing disputative letters to the military authorities.

39. As regards the action of the Local Governments, it was remarked that whilst giving to their Officers, in cases where these have acted in conformity with the regulations and with the temperate spirit above enjoined, that support which, in such circumstances, justice and policy alike demand, the Local Government should not fail to deal promptly and efficaciously with officers, who, by neglect of these orders and admonitions, obstruct the public service, and bring a bad name on the department to which they belong.

40. In the cases of difference which arise, the faults are not always, however, on the side of the officer of the Public Works Department. Some officers of the Department, it is true, disregard the rules bearing on this subject, and fail in the respect due to Commanding Officers, but, on the other hand, the latter not unfrequently regard the Executive Engineer as one of their Military Staff, and ignore the rules laid down by Government for their guidance in dealing with the Department and its officers. It was therefore left to

[*P. W. Dept.*] His Excellency the Commander-in-Chief to give Commanding Officers clearly to understand their relation to the Department, and that the Executive Engineer is not one of their Brigade or Divisional Staff; that that Officer is directly responsible to his own departmental superiors, and through them to the Government, and that, if military authorities decline to recognize this departmental subordination by making their complaint to the proper quarter, i. e., to the Local Government, and assume to take the remedy into their own hands, it is impossible that discipline can be rationally or consistently maintained in the Department.

Supply of Stores from England.

41. The system under which public stores were supplied from England and landed in Calcutta having been found to be very imperfect, giving rise to confusion and much consequent correspondence, a Committee was formed for the purpose of taking the whole subject into consideration, and of devising some plan by which the complication of the existing practice might be avoided.

42. The duty was well performed by the Committee, and resulted in an excellent and practical Report, in which were suggested certain measures for adoption by the authorities in London and others for adoption in Calcutta. The latter included—

1st. Measures for simplifying the official routine connected with the receipt of stores from England, and recommendations of the method best adapted for each of the several Departments to follow in landing them.

2nd. The preparation by the Marine Department of a set of rules for the guidance of all concerned, whether Government Officers or persons connected with the ships which bring out the stores.

3rd. The construction of jetties with sheds and cranes to facilitate the landing of heavy stores for the Ordnance, Commissariat, Public Works, and other departments.

4th. The appointment of an agent for Government consignments to prevent the confusion and inconvenience, both to Government Departments and to the commercial public, which arose from the want of an office of reference and general control in details connected with the receipt of Government stores from England.

43. All the suggestions of the Committee were considered by the Government worthy of adoption, especially the appointment of an agent for Government consignments. The salary of this Officer and of his Establishment will doubtless be saved, and more than saved in the freedom from unnecessary charges for demurrage, while the appointment is also demanded not only by a consideration of the improved facility that will ensue in the transaction of public business, but also of the great value of the stores annually imported by the Government.

44. Steps were therefore ordered to be taken in the proper department for the settlement of details connected with the measures recommended to be taken in Calcutta, and the Report of the Committee was, at the same time, forwarded to the Home Government, with a recommendation of the early adoption of the suggestions it contained, applicable to the departments connected with the India House. Measures have in consequence been adopted by that Government which will, it is hoped, remove many existing defects. [*P. W. Dept.*]

Question of the indispensability of candidates for admission to superior grades of the Upper Subordinate Establishment in the P. W. D. first passing through that of Probationary Assistant Overseer.

45. It was explained to the Government, North-Western Provinces, by whom the question marginally noted was raised, that when candidates are possessed of previous experience in engineering, and if such qualifications justify their claims to a higher position, they might be admitted at once as Sub-Engineers; but that, in such cases, the appointments should be temporary for six or twelve months, in order to test the real value of the candidates: while, on the other hand, men who had never done executive work should not be admitted except as Probationary Assistant Overseers.

Scheme adopted by the Home Government to meet requisitions from India for Civil Engineers and Supervisors for the Public Works Department.

46. The difficulty and delay experienced in England in meeting the not unfrequent requisitions from India for Civil Engineers, Supervisors, &c., for employment in the Department of Public Works, combined with the obvious objections to sending out men of mature age, not inured to the climate, ignorant of the native languages, and having much to learn respecting indigenous labour and materials, have induced the Home Government to adopt a scheme by which regular provision will be made for what may be looked upon as a regular demand.

47. Under this scheme a certain number of junior appointments in the Engineer Establishment, and in the Upper Subordinate Establishment of the Public Works Department in India, have been declared to be open to public competition which has been invited. Of the successful competitors, one half in each Class, with the designation of Probationers of the 1st and 2nd Classes respectively, will be sent to Bengal, and the other half in equal proportions to Madras and Bombay. From date of embarkation, or from any other, as may be arranged in their covenants, and while studying in India, they will receive a salary of Rs. 170 and 85 respectively; and when pronounced by the Principal of the College sufficiently qualified, and after having acquired a colloquial knowledge of one of the native languages, they will be transferred to the effective establishment of the Public Works Department, with the grade to which their attainments may entitle them.

48. On the arrival of the first batch of Probationers, they were sent on at once to the Thomason College at Roorkee, where the necessary arrangements were made for their reception and further instruction. The Principal of the College was, however, of opinion that having already served three years with a Civil Engineer, they would most rapidly

[*P. W. Dept.*] and profitably acquire, in the practice of actual work under superintendence, that experience and knowledge of Indian work which is required to fit them for independent usefulness.

49. It has not been thought desirable, however, to depart from the course laid down by the Home Government, until that course has had a full trial. Practical experience will thus be obtained, and any modification that may be found necessary can then be adopted.

50. Till 1856 a very limited number of warrants was allowed for the benefit of the Military Subordinates of the Public Works Department; but by Notification of 17th June of that year the establishment was put on a more liberal scale (vide margin).* To this increased establishment was annexed a limit of qualification, by which men were required to have served as soldiers for 18 years and to have been Sergeants of not less than eight years' standing before they could be eligible for the grade of Sub-Conductor. Above this grade well-conducted Warrrant Officers were to rise by seniority, but no Warrant Officer was to be promoted to a higher grade till he should have served two years in the grade below.

Revised Rules for the promotion of Military Subordinates of the Public Works Department to Warrant Grades.

* Deputy Commissaries	3
Assistant "	3
Deputy Assistants	3
Conductors	15
Sub-Conductors	20
	44

51. In July 1859 there were two vacancies in the first rank, none in the second, one in the third, and two in the fourth, whilst the lowest grade was entirely vacant.

52. The new organization of departmental ranks facilitated the reward of merit by departmental promotion, and the promotion to Warrant Grades was intended chiefly as the reward of long good conduct and service which might not always be accompanied by that ability which recommends to high departmental promotion.

53. While the actual effect of the restrictions has been, as shown above, to render the benefit of the increased scale of little immediate value, late events had given various Military Subordinates of the Department a claim to consideration. These circumstances, together with the fact that when the scale was once filled up there could be no profusion in promotion, induced the Government to modify existing restrictions in the following respects :—

1st. The period of service from enlistment has been reduced from 18 to 15 years, and that of service as Sergeant from 8 to 5 years, for promotion to first Warrant.

2nd. Exceptions as regards these last restrictions will be permitted in cases of notable military service, whether with an army or where (as in 1857) good service has been performed by almost isolated individuals in the protection of life or public property.

3rd. Where there are vacancies in a higher grade because some in the next lower had not served long enough for promotion, this circumstance is not to prevent the promo-

tion of men in a still lower grade who have served the prescribed period, provided the aggregate number of Warrants in the higher grades be not exceeded. [*P. W. Dept.*]

54. Under these modified rules the grade of Sub-Conductor was filled up half by Sergeants of the Department who had the greatest claim from seniority combined with good conduct, and half by Sergeants who had claims from good military or quasi-military service, with only a secondary regard to seniority.

Disbursement of money by P. W. officers.

55. In order to obviate certain inconveniences which were found in practice to result from the rule prohibiting the payment, by any Public Works officer entrusted with public money, of any salary, &c., to Public Works establishments prior to the audit of the bill, or without the permission of superior authority, the power before vested in Chief Engineers alone to sanction one month's advance of fixed salary of persons belonging to the Department has been extended to Superintending Engineers, who have also been permitted to sanction advances of one month's authorized travelling allowance.

56. Executive Engineers have, at the same time, been authorized to pay, on their personal responsibility, in anticipation of audit, the arrears of authorized pay due to a discharged servant.

Posting of native students of the Thomason College to the D. P. W.

57. Owing to representations received through the Government of the North-Western Provinces, it was found necessary to introduce some changes in the plan before followed in dealing with these students. The practice was to post them at random to the Department of Public Works as soon as they were pronounced qualified and as graded by the Principal of the College, and to permit them at once to draw the lowest pay attached to each grade, which pay was, however, so high as to deprive the indolent and unambitious of any incentive to exertion.

58. Complaints were universal of the practical inefficiency of the young men; the College course had afforded them little opportunity of acquiring practical experience. It was however unreasonable to expect that without any intermediate training, the native students of the College should be able to pass at once to the practical duties of their profession; and it seemed to the Government of India that to afford a fair chance of success, the characters of the Officers under whom they were first employed was a very necessary point for consideration.

59. After careful consideration of the whole subject, it has been suggested to the Government of the North-Western Provinces to prohibit any miscellaneous posting in future; and to send such untrained men only to Divisions under charge of Officers who will take some interest in getting them trained to their departmental work. In order at the same time to give the young men the stimulus of self-interest, the salaries to be drawn by them during the period of probation has been sensibly reduced.

[*P. W. Dept.*] 60. As it was expected that a considerable number of time-expired men of Her Majesty's Regiments in India, whose period of service was about to expire, would claim their discharge it was thought very desirable to invite such men to enter subordinate branches of the several departments of the service. The measure was especially desirable in the Public Works Department, in which the want of european subordinates was much felt.

Employment in the Public Works Department of time-expired men of Royal Regiments.

61. The several local authorities were therefore directed, in communication with officers commanding Her Majesty's Regiments, to endeavour to obtain the services of non-commissioned officers and soldiers of good character of this class, and were authorized to employ them at once as Probationary Assistant Overseers even though not possessed, at the time, of the full qualifications required by the rules of the Department; on condition, however, that they passed the requisite examination within six months of their joining, and provided Executive Engineers were satisfied that with ordinary diligence they were likely to do so. It was left optional with the men to enter the Department either as soldiers or as civilians.

62. The services of several men have been obtained by this measure.

63. In order to remedy the unsettled position of Rajpootana as regards applications for sanctions to Public Works in that territory, it was decided that, so long as the Public Works Department there continues to be conducted by Officers of the Bombay Establishment, all references, &c., regarding the Department shall be disposed of by the Bombay Government.

Transfer of the Public Works Department at Rajpootana to the Government of Bombay.

64. In forwarding a report by the Superintendent of the Tributary Mehals in Cuttack on the subject of the road from Cuttack to Sumbulpoor, opened out by the late Lieutenant Wyld, the Government of Bengal remarked that the rapid construction of this road furnished an illustration of the good to be obtained by departing from the complicated rules of the Public Works Department on special occasions, and that it was an instance of a system which might be greatly extended with economy and advantage. It was explained, in reply, that the rules of the Department, designated as complicated, were framed to prevent heavy works being undertaken without proper thought or by incompetent persons, instances of both of which had unhappily been too numerous, but that there was no reason why these rules should not be departed from by the execution of special works in a special manner whenever good cause existed for doing so. Rules are necessary for general application, and perhaps the rules in the Code are too absolutely expressed, but no rules can be devised which will act mechanically and universally in relation to such subjects as those under consideration. It is the intention, however, to introduce into the next Code Supplement a note guarding against the misapplication of the rules alluded to.

Code rules regarding the construction of roads and other heavy works.

65. Until November 1852 these workshops were used only as the means of supplying the Canal Department with the requisite iron and wood-work. At that period it was determined to extend their operations, and render them capable of supplying to all purchasers such work as might not be easily procurable, or be beyond the skill of native workmen to produce. Since that time the progress and work of the shops have been marked and satisfactory. [*P. W. Dept.*]

State and capabilities of the workshops at Roorkee.

66. In October 1852 the value of the articles manufactured was Rs. 11,361, and the only one among these which required skill and appliances superior to those of the Native workmen was an iron shaft for a Saw Mill, which cost Rs. 699; while the report of progress of work done in March 1859 shows a total amount of Rs. 25,740, of which more than Rs. 15,000 is for the higher class of work; and the value of the articles in progress in March 1859 will, when completed, be Rs. 59,700. The out turn of work is gradually increasing; the monthly average for the year before the mutinies was Rs. 19,745, and that for the first six months of 1859 is Rs. 21,771; and this progress has been made in the face of many difficulties caused by the non-arrival and loss of stores in 1857-58, and the great and continually increasing demand elsewhere for labourers. The work-people have been altogether trained in the shops, and some of its best moulders were originally ordinary unskilled day-labourers.

67. The financial results of the workshops from November 1852 to March 1859 are as follows :—

	Rs.
The debit side, including Establishments, repairs, interest, and depreciation on block, &c., amounts to	2,02,486
The credit side, including percentage on work done and materials sold, and credit from stock account	1,09,389
Balance against	93,097
This is reduced by certain estimated credits on half-wrought material, manufactured goods in stock, and works in progress	89,834
Net balance against	3,263

68. But in estimating the significance of this small deficit, it has to be considered that one of the chief objects in establishing the workshops on their present footing was to train native artificers, and therefore the advantage of expert labourers has been only partially enjoyed. Moreover, until 1856, credits were given to this account at the rate of 10 per cent. only on all work. This was found to be wholly inadequate, and the credits now given are 25 per cent. on finished work, 15 per cent. on half-wrought material, and 10 per cent. on value of materials sold. The deficit is partially due to the former low rate. The Machinery and Tool Accounts show a balance of Rs. 1,292 to be set against

[*P. W. Dept.*] depreciation of machinery. The Foundry Accounts exhibit a balance against the Foundry of Rs. 7,327.

69. The whole amount of work executed is valued at about 13½ lakhs, of which 11 lakhs are the value of work sent out, and 2½ lakhs that of machinery used in the workshops. But the demand has always been greater than the Superintendent has been able to meet; either from want of material, deficiency of skilled artizans, or inability of the foundry to turn out the requisite quantity of castings. Hence some complaints have arisen of a want of punctuality in executing orders, though the opinions expressed on the work done have, generally, been favourable.

70. Considering the workshops as an educational establishment, their influence has been very considerable with artizans who work for their daily bread and turn their increased skill to immediate use. The machinery required in the workshops is now invariably made by them. Several who have learnt their trades in the workshops have set up for themselves in Roorkee itself, and others have established themselves in neighbouring stations. It is hoped that much good has thus been silently effected.

71. But as regards the students of the Thomason College, the Principals have always held that, when the time for study was not sufficient for a sound theoretical training, it was inexpedient to waste any of it on a superficial and delusive practical one. It is the intention to form workshop classes who will receive a series of explanatory lessons on the various workshop operations. Beyond this it is not anticipated that the workshops will be of much use to the College.

72. With apprentices the case is different, for, to these, work in the shops is the main and serious business of their lives. There are at present 14 native apprentices, drawn from various castes, and receiving a subsistence allowance of Rs. 3 each per mensem. These come forward freely compared with Europeans, and the number will probably be further increased when those now present leave Roorkee and exhibit their skill in distant places. The very small number of european apprentices is easily accounted for irrespective of the smallness of the sum granted as subsistence allowance. The Superintendent, reports that he has had many applications, but only three europeans have been apprenticed since the mutiny, and of these, two were allowed to withdraw on repaying the subsistence allowance they had received.

73. The greatest barrier to progress is the insufficient and uncertain supply of raw material. Fuel, sand, and fire-clay are found in the neighbourhood, but the greater part of the supply of iron has hitherto been imported from England.

Preservation of buildings from the ravages of white ants.

* Appendix C.

74. Memoranda* on measures that have been adopted with success in certain cases for the preservation of buildings from the ravages of white-ants have been distributed to Departmental Officers for information.

STANDARD PLANS. [*P. W. Dept.*]

75. Standard plans of the following civil and military buildings were approved during the year under review.

CIVIL.

Toll House with out-offices ; and Gate.

MILITARY.

Hospital for women and children.

Bakery for 1,500 men.

Block plan of artillery buildings.

Privy for two companies of european troops.

Wash-house and urinary for one company of ditto.

76. In issuing the two last named plans the necessity for the daily removal of the ordure to a distance in all ordinary situations was strongly impressed upon the local authorities. It was pointed out that no privy or urinary was good from which the filth is discharged into drains near Barracks, and that the best way to keep necessaries clean is to convey every thing away, daily, to a distance; burying the ordure in deep pits. If thrown into drains and thence discharged into tidal nullahs or rivers, more or less nuisance is the result.

77. Cesspools as places of deposit for soil were absolutely prohibited; and their use even as urinaries was directed to be avoided as much as possible by the use of portable vessels at night. Cesspools may answer for a brief period, but ultimately the result is one fatal to the health and comfort of all in the neighbourhood.

78. Instructions were at the same time issued regarding the use of charcoal as a deodorizer. Chief Engineers were directed to consider the means best adapted for the daily removal of urine and filth, and Superintending Engineers were told to consider it an important part of their duty on inspections to report on the practical working of the above arrangements, and on the real state of Barrack out-offices. Superintending Engineers were also given to understand that though the details of conservancy had been recently transferred to another department, no opportunity should be lost of aiding that department in a matter so important to the health of troops, so closely connected with the work of this department, and in which the arrangements were yet so far from attainable perfection.

[*P. W. Dept.*] GENERAL OBSERVATIONS REGARDING WORKS.

79. Under this head matters of general moment only and those in which the Government of India has been more immediately concerned will be noticed, leaving it to Local Governments to embody in their reports all details of the actual execution of works.

Unfinished works.

80. And here may fitly be introduced certain observations recorded by His Excellency the Governor General on the subject of unfinished works, a matter to which His Lordship's attention was specially attracted during his tour in 1859-60.

81. A great number of such works exists in various parts of the country. Many of them were altogether suspended when financial restriction first began to take effect in 1855-56. The contraction of operations was sudden and stringent, and the result was the interruption of many works on which large expenditure had been incurred, whilst in such a state that little benefit could be derived from them. In the Punjab, especially, instances are numerous where sections of road of excellent construction are interrupted by other sections barely passable; tunnels half driven; bridges half built or uncommenced, though the material is deposited on the site; costly buildings of other kinds left half finished; churches of creditable design roofless or otherwise incomplete; the profitable return from works of irrigation delayed.

82. Though, perhaps, this is seen to the greatest extent in the Punjab, because there the expenditure on public works had been the largest, and the effects of a sudden stoppage were therefore most extensive, this state of things is by no means confined to that province, nor its origin to the restrictions alluded to. Later difficulties and other causes have in many instances interrupted or retarded works.

83. It cannot be too strongly impressed on all Local Governments, or too constantly kept in mind by the Government of India in its supervision of their proceedings, that no money is so utterly wasted as that spent in half doing work, and that the duty of completing half-done work should take precedence of everything that is not of a positively urgent character.

84. This may look like a common place, but the admonition is not unnecessary.

85. Its observance requires effort and purpose. The temptations are often strong to prefer new schemes of promise to old ones projected in other years, under other administrations it may be, and often under other circumstances.

86. If the circumstances be so changed that a work once considered desirable and useful can now be pronounced positively undesirable, and an actual waste of money, it cannot be a duty to complete it. But pleas far short of this are too often effective in such cases. They ought not to be so, and in every case where the plea falls much short of it, a substantial precedence should be given to the completion of the works already begun over the commencement of new work, even where the latter is of greater promise.

87. In a correct view, this principle will embrace some classes of work which may not at first appear to come under its operation. [*P. W. Dept.*]

88. Thus, wherever a road, which has been completed, so far as has been provided in the original project, is in truth only a part of an important line of communication, this line may be regarded as only partially done, and the completion of such a line should have a claim to a high place in the scale of precedence.

89. Lines of road also giving access, or serving as feeders, to railways come under the same view. The railway without these is essentially incomplete for its object; and, as no works have been created at so great expense, in regard to none is the application of this principle more urgent.

90. There is nothing inconsistent with these views in the modification of the original designs of an interrupted work, where those designs have been projected on a scale admitting of reduction.

91. Though the Government of India has not entirely neglected this principle of late (as, e. g., in the measures taken for hastening the completion of the Bombay and Agra Road,) there is still room for its stricter application. As instances in point may be noticed the Lahore and Peshawur Road, the Great Deccan Road through the Saugor Territories, Nagpoor and Berar, and the Patna Road. All these might, with great advantage, be completed in a manner adequate to the importance of the lines, though on a less costly scale than was at first contemplated.

92. The application of this principle need not be so rigid as to exclude all new schemes till all works coming under its operation have been completed. But something approaching to this must be carried out under the existing limited assignments; and, even when larger funds are available, a decided and recognized precedence should be given, as a rule, to unfinished works, and such an ample share of the disposable assignment should be set aside for them every year as will ensure their early completion.

93. It is hoped that if this plan is steadily pursued, the Government will be able, in a few years, to shew results of P. W. expenditure far more satisfactory than those now visible.

94. These views have been communicated to the Local Governments.

MILITARY WORKS.

Accommodation for troops.

95. A very large expenditure has been incurred in this Department for the provision at various stations of buildings, &c., required for the shelter and comfort of european troops. On the first influx of troops, consequent on the mutinies, the energies of the departmental officers were taxed to the utmost to meet the requirements for their shelter, and a large proportion was, of necessity, accommodated in Barracks run up hastily for immediate use, and which have to be replaced by buildings of a more substantial and costly character.

[*P. W. Dept.*] 96. It is not necessary here to specify the different stations at which new barracks have been erected, or where those injured during the mutinies have been re-built. The annexed statements will show, at a glance, the accommodation for European Troops throughout the country available, under construction, and ordered, and whether the buildings are of a temporary or permanent character.

Appendix D.

97. A similar statement of the accommodation for native troops, police battalions, &c., is now under preparation.

Repair of cantonment roads, drains, &c.

98. The system adopted experimentally in the Punjab of allowing certain fixed sums monthly for keeping in repair the cantonment roads and drains of the principal military stations in that province having been found to work well, has, at the recommendation of the Commander-in-Chief, been extended to military stations in all the provinces more immediately under the control of the Government of India, and committees have been ordered to be convened to fix the amount of the monthly charge to be allowed for each station.

ECCLESIASTICAL WORKS.

99. In this department also there have been large demands, and efforts have been made to provide the necessary accommodation, either by the erection of additional temporary or permanent buildings, or by the enlargement of existing ones.

Iron Church at Rangoon.

100. The Commissioner of the province reported the erection, at Rangoon, of the iron church sent out by the Home Government. The cost, up to date of report, had been Rs. 62,300, but an enclosure wall was required, and it is estimated that the total expense will be about Rs. 65,000.

101. The work being novel, difficulties and delays had occurred; but from the experience now gained these will be obviated hereafter; and it may thus be expected that the cost of completing any similar structure in future will be sensibly diminished.

102. Some defects too in the building were brought to light, amongst which may be noticed the grave one, that the windows were all fixtures and could not be opened; also the want of verandahs; and the insufficiency of the gutters to carry off the rain-fall. Another defect was that the noise caused by rain falling on the roof and beating against the sides was found to be very inconvenient.

103. These and other minor defects have been brought to the notice of the Home Government with a view to their being avoided in the event of a similar building being hereafter required.

INDUSTRIAL WORKS. [P. W. Dept.]

Discovery of Coal in the Hills near Murree.

104. Specimens of Murree coal having been sent to the Geological Survey Office for analysis the report received was so encouraging, and the discovery promised to be of such vast importance should the bed be extensive and generally of good quality, that it was decided to have the localities examined by a competent and scientific geologist who would be able to supply definite and reliable information both on the scientific and economic conditions of the deposits. The duty was, therefore, entrusted to Mr. H. Medlicott, professor of geology in the Thomason College, a gentleman well qualified for the work, and in whose opinion on such a question the Government had reason to confide.

105. Subsequent examination of the locality, however, did not justify any further expenditure. The papers were, nevertheless, interesting, and have been printed for circulation.

POST OFFICES.

General Post Office and Electric Telegraph Office in Calcutta.

106. Designs of the General Post Office and Electric Telegraph Office for Calcutta having been received from England, preliminary steps have been taken towards its erection.

107. Minute examination of the plans and specifications, preparation of a detailed estimate with indents for iron-work and other materials required from England, examination of the soil at the site for foundations, and other duties connected with the work, could not obviously be undertaken by the Civil Architect at the Presidency in addition to his multifarious duties, and the work has therefore been entrusted to Mr. C. G. Wray, a Civil Engineer and Architect late in the employ of the E. I. Railway Company.

MARINE WORKS.

Proposed establishment of a new port at Sedasheogurh in North Canara, and improvement of the means of communication therewith.

108. Much correspondence has passed on these subjects between the Home and Indian Governments, the details of which it is not necessary to recapitulate here. It may briefly be stated that the enquiries and survey made by the Madras Government went far to prove that no more convenient situation than Sedasheogurh could be found for one of the additional harbours so much needed on the western coast, and that neither serious difficulty nor disproportionate expenditure were to be anticipated in forming in that situation a harbour at once accessible, capacious, and secure.

109. With the exception of the fair-weather port of Tuddree which is closed for three months in the year, there is not along the whole line of Coast southward of Bombay any anchorage deserving of the name of a port; and, even if the fact were otherwise, communication between such a port and the interior would almost everywhere be intercepted by the nearly continuous barrier presented by the Western Ghats. Midway, however, between the extreme points of this range an opening occurs, through which a river issues.

[*P. W. Dept.*] The Ghats leading to Sedasheogurh are the Sangawarree on the north and Kyga on the south, coming down upon the river near Mullapoor, about 20 miles from the mouth, and up to which the river is navigable.

110. The first want to be met, is land access to the port. It was proposed to provide this by means of a railroad, which, besides opening the Dharwar cotton fields, would also afford ready access to the Southern Mahratta country at all seasons of the year. The proposal for a railway had, therefore, considerable military and commercial importance; but it would be premature to entertain this project before the port had been fairly tested and before a single cargo had been shipped.

111. On the whole it was doubtful whether the Govt. of India would be justified, under present circumstances, in relaxing financial restrictions in favour of any part of the works proposed in connexion with the new harbour; but as there was no question that measures for affording free access to the port from the interior should take precedence of any operations for the improvement of the port itself, and the great commercial importance of opening the cotton field was undoubted, a project for a road from Sedasheogurh to Hullial in the Dharwar Territory has been sanctioned, and will it is hoped shortly be commenced.

Light-house on the Alguada Reef about 20 miles south of Cape Negrais; British Burmah.

112. The official correspondence regarding the construction of the Alguada Light-house has been already published as a Selection from the records of the Govt. of India (No. 25). From that correspondence it will be seen that Captain Fraser, Bengal Engineers, after having made a careful survey of the Reef and its neighbourhood, was specially deputed to England to study the subject of the construction of the proposed Light-house. His Report (which will be found in the above Selection) was duly submitted after communication with Mr. Stephenson and other gentlemen eminent in this branch of engineering, and the proposals it contained were approved both by the Indian and Home Govts.; but want of funds prevented the immediate prosecution of the work. It was the full intention, however, of the Govt. to put it in hand on the first favourable opportunity, and in December 1859 the necessary steps were taken to carry out this intention.

113. Captain Fraser writing from Callagouk, the island quarry whence stone for the Light-house will be taken, anticipates completion of the work by the end of the cold season of 1862-63.

Proposed boat harbour at Beypoor, the western terminus of the Madras Railway.

114. Early in 1859 the views of the Government of India were solicited by the Madras Government as to the probability of overland communication between England and Madras and Calcutta being diverted into this channel on the opening of the railway in case the port of Beypoor (on the Malabar Coast and the Western Terminus of the Madras South-West Line) should be so improved as to admit landing mails and passengers. This object was proposed to be attained by the formation of a boat harbour, which it was estimated would cost about one lakh of rupees; and to this

extent expenditure was contemplated by the Home Government, who fully approved of [*P. W. Dept.*] the object.

115. The original estimate was, however, only a rough one, in which the cost of various necessary parts of the work was not included. The detailed estimates subsequently prepared amounted to Rs. 3,61,800, and even this larger sum did not represent the full amount that would be required, as the cost of a light house was not included in it.

116. Before sanctioning this expenditure, the Government of India desired a nautical opinion as to the practicability of access to the port during the south-west monsoon. The papers were therefore referred to Captain Rennie, the Superintendent of Marine, and to Lieutenant Taylor, of the Indian Navy, the latter of whom had had better opportunities of forming a reliable judgment on the suitableness of Beypoor for the purpose indicated than any other officer in the service. The opinions of both officers were adverse to the project, as involving the outlay of a large sum of money to very little if any useful purpose, for it was considered very doubtful whether even steamers could safely anchor off the coast during the monsoon months, the only period in which the boat harbour would be of much use. The project was consequently abandoned; and it has been proposed by the Madras Government, in its stead, to open a line of inland navigation which will connect the Madras Railway from a point near Beypoor with Cochin and Aleppee.

NAVAL WORKS.

Graving Dock at Kidderpoor.

117. The further consideration of the project for a Graving Dock at Kidderpoor has been deferred pending the arrival from England of an Officer who is now preparing to undertake the supervision of the works, and who will have opportunities of inspecting the best dock-yards in Europe.

118. While, however, the project itself was in abeyance, it was thought desirable at once to invite Commander Rennie, C. B., the Superintendent of Marine, to consider, in communication with the officers of the Public Works Department, what arrangements would be necessary in the dock-yard, both in respect to any additional ground that might be needed to compensate for the space to be occupied by the new dock, and in regard to the disposition of any subsidiary buildings in connection with that dock and its contemplated use for the reception and repair of large Steamers.

119. In his report Captain Rennie pointed out the necessity for a thorough re-modelling of the existing arrangements in the dock-yard, and noticed also the want of accommodation to meet the increased requirements of the Government Marine service. Of the correctness of his views there could be no question, but the impossibility of carrying out the entire plan at the time compelled the Government of India, while approving generally

[*P. W. Dept.*] of the scheme, to limit its attention to such portions of it only as were most urgently needed; and as the whole power to re-model the yard satisfactorily appeared to depend upon the diversion of the Garden Reach road, so as to obtain in one plot the additional ground required, the Government of Bengal was requested to submit a report and accurate estimate of the expense of effecting this object, accompanied by a rough estimate of the cost of the whole proposed improvements.

120. The report was duly submitted. The cost of the whole scheme was roughly estimated at 20½ lakhs of Rupees, and the cost of obtaining the additional ground at about 2½ lakhs.

121. There were some points in connection with the general arrangement, &c. of the Yard which appeared susceptible of improvement, and to these the attention of the Local Government was drawn. The internal arrangements, however, are so much matters of experience, that it has been suggested that they should be left to be decided hereafter in communication with the officer who is to construct the Graving Dock. Meanwhile the Bengal Government was authorized to commence taking up the land for the road, and to construct the road itself as soon as funds can be allotted for the purpose.

Graving Dock at Bombay.

122. The construction of this dock has been authorized at a cost of Rs. 4,80,056.

AGRICULTURAL.

Rights of irrigators to the waters of rivers passing through provinces under separate governments.

123. This question was submitted by the Government of Madras for the decision of the Government of India.

124. The matter originated thus:—The Government of Mysore proposed to throw a dam of very large dimensions across the valley of the Huggry River at a point about 50 or 60 miles from its water-heads. The river runs for about 100 miles within the Mysore territories, and somewhat less within the limits of the Madras Presidency; its upper valley being in Mysore. The area of drainage within Mysore is about 2,000 square miles, and about 3,000 within Madras. The Huggry becomes ultimately a tributary of the Toombuddra, and helps, through that river, to feed the Kistnah.

125. Some irrigation in the Bellary District is dependent on the Huggry, and the Government of Madras therefore claimed consideration for the water rights of the country below the contemplated dam, as it was asserted that the present scanty supply of water from the river would be considerably diminished by the proposed work to the injury of the Bellary cultivators, unless a stream should be allowed to escape through the sluices of the dam. It was also maintained that it was the duty of the Madras Government to take measures to satisfy itself of the security of a bund retaining such an enormous mass of water, as a breach in it would produce most disastrous results within the Madras Presidency.

126. The Commissioner of Mysore on the other hand disputed the right of any interference on the part of the Madras Government. It was asserted that the dam would only intercept the drainage of 2,000 square miles, and that below its site the Huggry receives several tributaries, one of which alone discharges, when in flood, half as much as the Huggry itself at the proposed site, and it was argued that the ryots of the Bellary District would not consequently suffer by the construction of the dam. It was maintained, moreover, that if it were once admitted that the Madras Engineers were to be consulted before a dam was thrown across a stream like the Huggry, the inevitable deduction would be that they must be consulted in every similar case, and the authorities in Mysore would no longer be free to make alterations and improvements in those works which feed the Penaar and the tributaries of the Polaar, on which the prosperity of Mysore depends, but would have to await the approval of those less capable of forming a judgment, and who might be influenced by partiality towards their own projects. [*P. W. Dept.*]

127. The question referred for decision by the Madras Government was one solely of principle, viz., to settle how the rights of the river-bordering population on a stream common to two or more separate Governments are to be adjusted. It was at the same time suggested by that Government that, after settlement of the principle involved, an appropriate mode of arranging the details would be for each Government to appoint an Officer jointly to investigate the matter and propose a plan for the common benefit of both territories, and such as would not compromise the interests of either.

128. Questions of the kind under notice had often been discussed in the North-West Provinces, and the general principle ultimately adopted was that of full and equitable respect for all rights actually existing at the time to the use of the waters in dispute. This was the principle proposed by the Madras Government as the basis of its arrangement with the Government of Mysore, and its fairness could not be disputed. The mere possession of jurisdiction over the upper valley of rivers cannot give the unqualified right to deal with the waters without any reference to the interests of the population of the lower valley or drainage basins.

129. Upon a full consideration of the subject, it was ruled by the Government of India that in dealing with waters of rivers traversing conterminous provinces under separate local governments, the principle to be adopted should be that of strict respect for existing rights to such waters as they are enjoyed at the time when projects affecting their distribution are taken in hand; the fact of actual enjoyment of the use of the waters at the time being accepted as all the proof necessary to establish the right of the users. Adequate provision having been made for the security of such rights, the government which commands the upper valley of the rivers to be at perfect liberty to use the supplies of water under the ordinary control of the Supreme Government alone.

130. As regards the particular case in dispute, the proposal of the Madras Government for the nomination of two qualified officers, one by each Government, for the purpose of enquiring how far the interests of the Madras provinces would be affected by the proposed dam, was sanctioned, with the understanding, however, that the Commission was to limit its enquiry to the determination of the real extent of those interests, and of the

[P. W. Dept.] provisions necessary to secure them against damage or to compensate those concerned for losses that may inevitably be sustained, leaving untouched the questions of the stability of the projected works, and of the professional expedients whereby its conclusions regarding the protection of existing rights were to be worked out in practice. The duty of the Commission was thus restricted, because the Government of India agreed with the Commissioner in thinking that it would be inexpedient to weaken in any way the personal responsibility of the Engineers of the Mysore Government for the permanent and effective action of the works designed or constructed by them. To give to the Officers of the Madras Government the power of inspection over works within the limits of Mysore would doubtless tend to weaken this responsibility. If the works were found to work unsatisfactorily, the imperfections could of course be pointed out by the Madras Government, and on failing to obtain the requisite improvements, the interposition of the Supreme Government could always be sought.

Mittrow Canal in Sindh.

131. The Mittrow Canal, designed for irrigation and navigation in Sindh, is one of the lines of arterial canals embraced in the scheme of Sir Bartle Frere, late Commissioner of Sindh, for systematically carrying out such objects.

132. The Mittrow Canal was projected for the purpose of utilizing the surplus water conveyed to the E. Narra River by the new Roree supply channel, and is a natural extension of that work.

133. The Owwud branch of the Narra leaves that river on its right or west bank bewteen Inkrow and Mittrow, and rejoins it again at a point lower down near Bukkur. By means of dams across the Narra and its branches and across the channels leading to the vast depressions along its eastern bank, the whole of its waters have been turned into the Owwud, and it is proposed to head them up by a weir crossing that river in a northerly direction, and an earthen dam carried in a W. and N. W. direction. The head of the canal will be at the point of junction of the dam and bund near the village of Mittrow; a reservoir of 12 square miles in area will thus be formed, of sufficient capacity to contain the whole of the natural supply, and of that derived from the Roree channel during the dry months, while in the rainy season sufficient water will flow over or through the weir to inundate the land along the banks of the Narra below, which is the only process of fertilization capable of application in those low-lying localities.

134. The waters thus retained will be carried by means of the Mittrow Canal along the high land to the west of the Narra, parallel to its direction and beyond the limits of its highest known floods. The water would thus be raised above the level of most of the land between the Canal and the Narra which it is designed to irrigate. In these barren tracts there are occasional traces of extinct canals, but the population is at present represented only by a few herdsmen, who derive a scanty supply of water from the wells they have sunk. It was at first doubted whether cultivators would be found to make use of the water when supplied, but these doubts were satisfactorily set at rest by an influx of cultivators even when the supply was afforded by a casual flood.

135. The report of the Local Government will doubtless contain full details of this important work, the execution of which has been authorized. It is thought that the Canal will not cost less than six lakhs of Rupees, but if the expected results are realized, the Canal will repay itself in a few years. [*P. W. Dept.*]

N. W. P. Canal Returns for 1857-58

Financial condition of the Irrigation Department, North-Western Provinces, during the years 1857-58 and 1858-59.

136. From the statistical papers submitted by the Government of the North-Western Provinces, the following results were gleaned by a comparison between 1857-58 and the previous official year :—

Ganges Canal.

Years.	Income.	Expenditure.	Difference.
	Rs.	Rs.	Rs.
1856-57	1,09,760	3,10,307	2,00,547
1857-58	80,317	2,17,882	1,37,565
Difference	29,443	1,07,575	

Western Jumna Canal.

1856-57	2,63,236	1,55,813	1,07,423
1857-58	2,84,183	89,811	1,44,372
Difference	29,053	66,002	

Eastern Jumna Canal.

1856-57	89,602	1,30,739	41,137
1857-58	66,218	72,679	6,461
Difference	23,884	58,060	

Dehra Dhoon.

1856-57	10,418	14,694	4,276
1857-58	10,715	15,031	4,316
Difference	297	337	

137. The general results were shown on this occasion in a form long customary in the Canal Department. In this form of account the amount expended on dead stock or the block of the canal is entered on the debtor side, and 5 per cent. interest added to the amount each year; the aggregate of current expenses from the beginning is also charged on that side swelled by a similar charge of interest yearly compounded. The creditor

[P. W. Dept.] side shows the gross revenue from the beginning, similarly credited with compound interest. A balance is then struck, which, with allowance for the dead stock, is taken to represent the general financial result of the whole enterprize. In this manner, for the official year under notice, 1857-58, the Ganges Canal showed a deficit of 32½ lakhs; the Western Jumna Canal a surplus of 43¾ lakhs; the Eastern Jumna Canal a deficit of Rs. 62,500; the Dhoon Canals a deficit of Rs. 1,43,877; the Rohilkund Canals a surplus of Rs. 11,621; and the Nujjuffghur Works a surplus of Rs. 1,35,284.

138. Though the above form of account is theoretically correct, it would be satisfactory to have periodical Returns in the simplest form of Capital and Revenue Accounts, showing the year's result as a dividend or deficit on Capital, without the introduction of the element of compound interest, and the submission of such Returns for the future has been ordered, with a resumé of the effect of the mutiny on the development of irrigation on the Ganges Canal, and a review of all subsequent progress, as well as of the progress of navigation with any other points of interest in connection with the Department since 1857.

N. W. P. Canal Returns for 1858-59.

139. The financial results of the operations of the year 1858-59, compared with the two previous years, are shown below. The Reports themselves, which are very interesting, will doubtless be found embodied in the Administration Report of the Local Government. A valuable Note by Colonel Baird Smith, late Superintendent of Irrigation, North-Western Provinces, is appended.*

*Appendix E.

Year.	Income.	Expenditure.	Difference.
	Ganges Canal.		
	Rs.	Rs.	Rs.
1856-57	82,751*	3,49,143*	— 2,66,292
1857-58	88,790*	2,53,150*	— 1,64,360
1858-59	1,63,554	4,59,539	— 2,95,985
	Western Jumna Canal.		
1856-57	2,63,236	1,55,813	+ 1,07,423
1857-58	2,34,183	89,811	+ 1,44,372
1858-59	3,29,452	1,56,514	+ 1,72,938
	Eastern Jumna Canal.		
1856-57	89,602	1,30,739	— 41,137
1857-58	66,218	72,679	— 6,461
1858-59	1,81,022	84,714	+ 96,308
	Rohilkund Canals.		
1856-57	22,430	28,626	— 6,196
1857-58	None	5,454	— 5,454
1858-59*	16,144	13,746	+ 2,398

* Corrected for remissions of Revenue since Report of 1857-58, and by the addition of a share of the directing establishment to expenditure.

Year.	Income.	Expenditure.	Difference.
	Dhoon Canals.		
1856-57	10,418	14,694	— 4,276
1857-58	10,715	15,031	— 4,316
1858-59	11,668	16,317	— 4,649
	Nujjuffghur Works.		
1856-57	.....	.....	.....
1857-58	14,437	2,786	+ 11,651
1858-59	15,690	3,092	+ 12,598
	Agra Irrigation Works.		
1856-57	.....	.....	.....
1857-58	.....	.....	.....
1858-59	8,164	7,670	— 494

140. The large increase in the expense of the Ganges Canal this year was owing to the mutinies, which prevented the execution, at the proper time, of the repairs due in 1857-58. It will be observed that in that year the expenses were considerably diminished.

141. The increase of the revenue of the Western Jumna Canal is satisfactory; but it will be necessary to incur a large expenditure to rectify the original defective levels of its bed. The subject has been pressed upon the Punjab Government.

142. The Eastern Jumna Canal has yielded a clear Revenue of nearly a lakh of Rupees, and is expected to yield more in 1859-60. The state of this Canal is altogether satisfactory, and the result of its management very creditable to Captain Brownlow, the present Superintendent.

143. The Rohilkund canals have cleared a profit, but it is as yet small. The attention of the Superintendent General has been drawn to the state of this work, in order to effect some improvement in their management. Colonel Baird Smith's Note explains why no very large returns are to be expected.

144. The Dhoon canals show about the same result as last year. On their state and prospects see Colonel Baird Smith's Note.

145. The Nujjuffghur Jheel works have as usual paid well, and the Agra Irrigation works are advancing satisfactorily towards a like result.

Mr. Bourne's scheme for reclaiming and colonizing the Sindh Saugor Doab.

146. The Home Government having forwarded for consideration a scheme by Mr. Bourne for reclaiming and colonizing the Sindh Saugor Doab in the Punjab by means of an inundation canal from the Indus, the project was fully considered by the local authorities, whose opinions on the matter, together with the views of the Lieutenant Governor of the province, will be found annexed.* It is not necessary here to give an epitome of them, but it may be remarked generally that, though a permanent canal would be a highly beneficial work, the

* Appendix F.

[*P. W. Dept.*] development of population and profit would be extremely slow in such a country, and it is improbable that any unguaranteed Company would undertake the work. It certainly was by no means the site which Government would select for guaranteed operations, nor was it a project in which the Government would be disposed to share.

First admission of water into the Baree Doab Canal.

147. The Government of the Punjab officially announced to the Supreme Government the first admission of water into the Baree Doab Canal on the 11th April 1859. This important work is still far from complete. The length absolutely finished is indeed only 52 miles, but this distance embraces the vast majority of heavy and difficult works necessary with canals like those of Northern India, drawn from the neighbourhood of mountains where the excessive slope of the country has to be obviated by expensive expedients, and where the channel has usually to cross the beds of torrents from the adjoining hills.

148. The large amount of 90 lakhs has already been expended on these works. It is to be regretted that the restrictions on Public Works expenditure in the Punjab which became necessary so early as 1855 have retarded the completion of the work, and the commencement of returns on the outlay. It is also a source of vain but inevitable regret that the canal in the lower part of the Doab is still unmade, whilst the railway which would have derived so much advantage both in construction and working from the previous completion of the canal will now probably precede it.

Appendix F 2.

149. The Government of India took the opportunity publicly to acknowledge the services of all the Officers, Engineers as well as Subordinates, who had for years been carrying on this great work in an obscure corner of the country, where few have witnessed their labours, the fruitful result of which has yet to come. This recognition of past services was more especially due to Captains Dyas and Crofton, who had been the leading spirits in the enterprize from its commencement, and whose failure of health, under the unflagging exertions of nine years, compelled them both to visit Europe at the time when so notable a point in the history of the undertaking as the admission of water into the Canal had been attained.

150. His Excellency the Governor General subsequently took the opportunity of his tour to visit the head works of the canal; he viewed them with much admiration; and is satisfied that the canal officers have spent the sums assigned to them most conscientiously in doing the work of the best possible quality. The object had not however been sufficiently kept in mind of working towards the earliest possible return, and of dispensing with all work that can be dispensed with until this return is secured.

151. It was not too late to reform the course of proceeding in this respect, but it was necessary that it should be done at once, and the particular attention of the Local Government has therefore been drawn to the subject.

152. The completed Canal project is estimated to cost, with its rajbuhas, or distributing channels about one crore and a half of rupees.

153. The costly and difficult head works required for the maintenance of the supply have been completed; the Lahore Branch has been completed and opened; the main channel down the Doab has been considerably advanced. Less progress has been made with the Subraon and Kussoor Branches. [*P. W. Dept.*]

154. But the laying out and excavation of rajbuhas has only just commenced. Hence, even from the open part of the canal, no revenue can yet be derived except through the existence of the old Huslee Canal, to which the works afford an enlarged and certain supply, and the revenue of which is proportionably augmented.

155. Had a portion of the means at the command of the canal officers been devoted to preparing the distribution channels *pari passu* with the works of the Lahore Branch, Government would now have come into the immediate enjoyment of a very considerable revenue.

156. The objects to which it is proposed that the whole available agency should now be directed are the following:—

1st. To the completion of rajbuhas and all arrangements for distribution of water on those parts of the canal which are otherwise ready, or nearly ready, for the supply of irrigation.

2nd. To the completion of the main line with all the corresponding channels of distribution in its whole extent, if necessary, but preferably to the first point where the existence of an escape will admit of its being used when partially complete.

157. All bridges or other costly works which may not be absolutely essential to the early productiveness of the canal works will be deferred.

158. It is unquestionable that ferries and fords (paved if necessary) could be substituted to a very large extent for bridges without any evil worth mentioning in comparison with the benefit to be derived from early exhibition of a favourable balance sheet.

159. It may indeed be urged, against the course above indicated, that the cost of the head and its difficulties is a fixed burden, which will bear a much greater proportion to a limited scheme than if the whole work and its branches were in active operation for irrigation. It may also be urged that branches in the Umritsur district will irrigate very rich land, and be very productive, for which reason they ought not to be deferred.

160. This last is a point of detail which has been left to the Local Government for decision. If it is thought that for such reason it will be well to proceed with one of those branches, rather than with the main line, it will be at liberty to decide to that effect. But vigorous prosecution of the main line seems, prima facie, preferable—1st. Because it is well advanced;—2ndly. Because of the length of navigation that it will afford;—3rdly. Because the character of the country through which it runs affords such

[*P. W. Dept.*] a field for showing what a Canal can effect in the reclamation of lands now affording nothing but a scanty pasturage.

161. The fact that on such canal schemes as that of the Ganges Canal and the Baree Doab Canal heavy expenditure continues for a long series of years without the commencement of a revenue tends seriously to discredit enterprizes of this character, and it is unquestionable that a different system of working must be adopted if it is hoped to see any similar extensive works of irrigation undertaken again in this part of India.

162. Should the work proceed at all points, as it is now doing, the effect, in the event of another financial stoppage, would be that the Government would have a large series of costly works in different parts of the Baree Doab incomplete, requiring expensive maintenance, producing no revenue, and at a stand-still.

163. But if one or two branches are in full operation and bringing in a substantial revenue, funds will be readily supplied for the extension and completion of the scheme on a similar system, whilst, even if financial difficulties should restrict supplies, a great result will have been secured.

164. It is also possible that, by such a limitation and concentration of the work, some part of the present staff would become available for other works of equal importance. The annual outlay on the canal, moreover, should not exceed what can be advantageously spent on the principles laid down above, and this limitation may afford additional funds as well as additional staff for other works. There is no desire however on the part of the Government of India to see the assignment to the canal reduced *below* what can be advantageously spent on these principles.

165. Nor is there anything in these principles inconsistent with the strong sense that is entertained of the importance of bringing unfinished works to completion. On the contrary, it is the exaggeration of the evil arising from the long deferred completion of works, caused by the existing system of expenditure on the canal, which it is desired to remedy by bringing its sections into the position of complete and remunerative works as fast as possible.

DYKES.

Abandonment of the Adjai River embankments.

166. The proposal to abandon these embankments was originally made in 1836 by Major Bell, then Superintending Engineer, on an inspection of the locality after an extraordinary flood. No steps were however taken to carry out his recommendation, and the bunds continued to be repaired and maintained till 1856, when Captain Beadle, late Superintendent of Embankments, after an inspection under similar circumstances, arrived at the same conclusion. In his Report on the subject Captain Beadle remarked that all attempts to make the

Adjai bunds continuous had failed and that the river inundation was a fertilizing and not a destructive one. He recommended therefore that the embankments, except those of certain specified localities, should be given over to the landholders to be cut or maintained as they thought fit; and if they declined to maintain them as private embankments, that the bunds should be removed as interfering with the beneficial drainage of the country and involving a large outlay on works not absolutely necessary and in some respects injurious. [*P. W. Dept.*]

167. Mr. Smith, Executive Engineer, of the Burdwan Division, held a contrary opinion, based partly on applications from the landholders, for the reconstruction and repair of some of the embankments, and on their attempts, when refused, to undertake the work themselves; while the Chief Engineer, Lieutenant Colonel Young, thought that no conclusion could be arrived at until the effects produced by the removal of the Damooda embankments should be seen.

168. Captain Beadle's proposals were supported by the Government of Bengal; and on full consideration of the arguments advanced for and against the measure, it was decided to act on that officer's recommendations, except as to the mode proposed for dealing with the abandoned embankments, on which point it was remarked to the local Government that it was not thought expedient that the State should take certain portions of the embankments in hand and leave the rest to be maintained or deserted at pleasure by the Zemindars. If the preservation of the abandoned bunds was not thought desirable, it should be prohibited; if on the other hand, the Zemindars were to be allowed the option of maintaining them, means should be provided for insuring their maintenance in an efficient state.

Operations at the head of the Mahanuddy Delta.

169. The following satisfactory results of the operations carried out at the head of the Mahanuddy Delta are gathered from a report submitted by Captain C. J. Harris, of Engineers.

170. Comparing the state of the Delta head in 1859 with its condition in 1855, Captain Harris states:—that in the dry season of 1855 there was a difference of five feet in the levels of the Mahanuddy and Kajooree, about three feet of which disparity has since been reduced, the general level of the Kajooree's bed having been raised three feet at least by the brushwood operations. Where hollows existed under the Cuttack revetment from 20 to 40 feet deep there are now sands higher, by 4 or 5 feet, than the water level of 1855. All hollows, save one, have been silted up and the bed of the Kajooree has, in particular points, also been raised various heights up to 45 feet. The deep channel of the river ran, in 1855, dead against the revetment wall and thence along the same. In 1859 there is a large sand bank between the channel and the wall; and the former has, no longer, the opportunity of undermining the latter. In 1855 breaches in the revetment were regarded as of certain occurrence. In 1859 they are scarcely admitted to be probable. In 1855 the set of the current of the Mahanuddy was on the right bank of the narrow neck at Naraje. In 1859 it is on the left; and the water on the former side has decreased in

[*P. W. Dept.*] depth 9½ feet while it has increased 7½ on the latter; precisely what was wanted. In 1855 the height of the sand bank at the very head of the delta opposite Berhampoor was on the increase, and had continued to increase enormously until the year 1858 during the floods of which the sands have flattened down in a most marked manner. In 1855 the Doablesur channel was shallow and blocked up by shoals. In 1859 it is found wide, deep, and clear carrying a large body of water into the Mahanuddy, and relieving considerably the Kajooree branch. In 1855 the sand bank, extended about one mile below Naraje; and it received no visible addition to its length until the floods of 1858. After their subsidence it was found to have extended half a mile further down the river. In 1858 a much larger proportion of the floods flowed into the Mahanuddy branch channel than had been the case in the year 1855. Direct proof of this will, it is stated, be furnised during the present year, in which the embankment officer has been directed to register daily the rise andf all of both the Mahanuddy and Kajooree branches, for comparison with similar observations made in 1855.

171. Of these improvements at the head of the delta all but a small percentage are due to nature; while the many improvements made in the bed of the Kajooree opposite Cuttack are the result of measures adopted by the Engineers to whom this important work was entrusted.

COMMUNICATIONS.

Lahore and Peshawur Road.

172. On a late journey to and from Peshawur, the subject of the road to that frontier station from Lahore necessarily engaged much of His Excellency the Governor General's attention.

173. This work was begun soon after the annexation of the Punjab, and the utter inadequacy of the original rough estimates indicates that it was commenced under an imperfect appreciation of the difficulties to be surmounted. The work advanced for some years with the free expenditure, but also with all the vigour and ability, that usually characterized the projects of Sir Robert Napier.

174. It has been often questioned whether an entirely different line should not have been chosen, passing by Ramnuggur, through the Salt range, to Chukkowal. There is no question that such a line would have been more easily and cheaply executed. But, considering how far this would have lain from the important towns and stations on or near the present road, it is doubtful if its adoption would have served the required objects.

175. A report on the road, as it stood in 1854, will be found in the 7th number of Selections published by the Government of India. That report, however, gave somewhat too sanguine a view of progress, and the estimates which it contained were still far below the truth, as the result has proved. Up to the 1st February 1854, the expenditure was stated at Rs. 24,66,000; whilst the completion of the work, with the exception of

metalling from Jhelum to Peshawur, was estimated at Rs. 31,56,000. Allowing an assumed rate for metalling, not included in that estimate, 65 lakhs would on that calculation have completed the road, with the exception of the floating bridges on the great rivers, which were not included in the estimate. [*P. W. Dept.*]

176. The actual result has been very different.

177. In 1855-56 the Government of India, finding the Estimates likely to be much exceeded, ordered the works to be suspended until the whole of the accounts should have been brought up, and until final estimates for the completion of the work should be prepared.

178. The suspension (which was attended to a serious extent by the losses which such sudden stoppages, however unavoidable, always involve) was stringently observed; work of an emergent nature, only, being continued; yet, up to 1st May 1858, the whole expenditure on the road had reached between 70 and 71 lakhs. †

† But this it is believed included the expenses of the Boat Bridges on the great rivers which were very costly.

179. Detailed estimates for the completion of the line were prepared in 1856 by Lieutenant Colonel (then Lieutenant) A. Taylor, the Superintendent of the road; but these have never been submitted by the Punjab Government, as it was considered that the demand, from its great amount, could meet with no acceptance.

180. As is noticed in Colonel Napier's Report of 1854,‡ and as later floods have since more fully proved the estimate of water-way required in the plain of the Rechna Doab, much of which is liable to inundation, was insufficient, and great injury was done to the work as first constructed. In fact under such circumstances it is impossible to form an accurate judgment of the water-way necessary, until a large porportion of embankment has been constructed, forcing the flood discharge to define its requirements.

‡ Page 23 of Selection.

181. In 1858, then, the case stood thus; the large sum of Co.'s Rs. 70,00,000 had been expended, and the result as yet was a road of which only a few miles near Attock were metalled; of which several sections, exceptional indeed, but in themselves considerable, were very far from being open to traffic (the links being supplied by temporary tracks); which exclusive of the four great rivers still crossed a number of unbridged streams of magnitude, liable at certain periods, more or less frequent, to be unfordable; and of which one extensive section had been greatly damaged, and was subject to submersion in some rainy seasons. The work meanwhile was at a stand.

182. In such circumstances Major Robertson, who had succeeded to the charge of the road on Lieutenant Taylor's being called to join the Army before Delhi, adapting the scale of his measures to the existing pressure on the Government, prepared a careful scheme for opening out the whole road to traffic at the lowest practicable cost.

[*P. W. Dept.*] 183. To discharge the occasional and widely spread floods of the Rechna Doab and of the Peshawur Valley, in many instances bridges were in this project dispensed with, and "metalled gaps" (as Major Robertson terms them) or causeways substituted; timber was introduced either wholly or partially in all the larger bridgesinstead of masonry; side slopes wrere reduced to a minimum, and in one instance only it is believed an inferior gradient was admitted, to avoid the expensive remedy of tunnelling, whilst bridges over several of the rivers were altogether deferred.†

† Viz. Chokonee (in Jech Doab). Deena (10 miles west of Jhelum). Sohan and Leh (near Rawal Pindee). Chel (twice crossed on edge of Indus Valley).

184. The Goverment of India authorized the work on this scale to be proceeded with in October 1858. Some delay occurred in the re-organization of labour for work which had been so long suspended, but considerable progress has now been made.

185. From a Report submitted by Major Robertson of the first year's operations it appears that what has been accomplished hitherto has been considerably within estimate.

186. The cost of bridging the rivers, as yet unprovided for, is estimated roughly by the Superintendent at about six lakhs, whilst he considers that the whole could be metalled for fifteen lakhs.

187. On these data, the whole cost of the completed road will be as follows:—

Expenditure up to the submission of estimate of 1858 ...	71	lakhs.
Amount of that Estimate	11½	"
Remaining bridges; and metalling	21	"
But as the last item is but roughly estimated it is probable that some considerable allowance must be added as also for expenditure which will be required to place the embanked approaches to boat bridges in a state of security, say ...	4½	"
Total ...	108	lakhs.

188. Previous impressions of expenditure on the road have been a good deal modified by the Governor General's inspection of the work.

189. Doubtless the vigour with which work was commenced and carried on between 1851 and 1856, in a country where nearly all skilled labour was a novelty, and where wheeled carriages were almost unknown, was accompanied by a large expenditure, whilst the scale and solidity of the road-way embankments,* and the high class of gradient adopted, 3 in 100, aimed at perfection more costly than may be judged to have been wise, now that the magnitude

* Width 40 feet, side slopes 5 to 1.

of the undertaking, the length of time required for its completion, and the consequent liability to interruption by failure of funds, are fully appreciated. But, without losing sight of this, it must also be admitted that at that time the whole spirit of the Government tended rather to stimulate than to check vigorous progress, with too little regard to calculations of cost. And little as it is desired to tolerate any recurrence to this system of wholesale working without proper estimates, the Government of India is not indisposed to the belief which some have entertained, that this large and energetic development of labour, and the expenditure by which it was accompanied on this and other great works in the Punjab, under Sir Robert Napier's advice and general direction, was one, at least, of the elements which impressed the most manly race in India with the vigour and beneficence of British rule, and, under Providence, tended through the maintenance of order and active loyalty in the Punjab to the recovery of Hindoostan. [*P. W. Dept.*]

190. It has already been said that the impressions as to the expenditure were modified by the personal inspection of His Excellency the Governor General.

191. This applies chiefly to that most difficult and costly section of the road which extends from the Kharian Pass on this side the Jhelum, to a few miles beyond the Indus at Attock, a distance of somewhat more than 130 miles.

192. Nothing but such personal inspection, or a model of the tract, could communicate a just idea of its difficulties. These are not to be estimated by counting on a Map the ranges of hills that have to be traversed or the great number of rivers that have to be passed, all, in the rainy season, of formidable discharge and velocity. One requires to see also how the vallies are filled by a confusion of distorted and half indurated strata, worn by the action of water into fantastic gullies and pinnacles, and how the up-lying plains and rolling country of the central region between the Jhelum and the Indus are torn by ravines, sudden, deep, formidable, and of infinite recurrence, in order to judge justly of the engineering tact and patience required to select a line through such a country, and of the enormous labour and inevitable cost that had to be faced in its construction.

193. The cuttings and embankments necessitated by this singular formation often approach, and sometimes exceed, sixty feet in height or depth. The construction of an embankment across a ravine involves of course a culvert for drainage. Let it be considered that a culvert under an embankment of such magnitude extends nearly to 200, sometimes, if oblique, nearly to 300 feet in length, and has often to afford for the sudden discharge of the rainfall in such a country as is above described, a water-way of ten, twenty, or thirty feet, and some conception may be obtained of the magnitude of the work as exhibited in this one feature.

194. Nothing struck His Excellency more than the careful and elaborate detail with which provision was every where made for the permanence of the road by securing it from the scour of water; every cutting being carefully flanked by catch-water drains, and

[*P. W. Dept.*] every natural accident taken advantage of to divert water from the surface of the way, or to avoid the multiplication of culverts where one could be made to do the work of two, by cutting or tunnelling through the intervening barrier.

195. Taken altogether, the Governor General has seen no Engineering work in India which impressed him so strongly with its grandeur and unquestionable utility, with the difficulties that had been faced, and with the duty of now carrying it to early completion.

196. Instructions have therefore been issued for the preparation of detailed Estimates for bridging those secondary rivers which were omitted from Major Robertson's project of 1858, and for metalling the whole line. Past experience leads the Government to press forward the completion o bridges as the first requisite, but metalling will also go on as means admit.

197. Too depreciatory an estimate of the value of the road, even in its present imperfect state, should perhaps be guarded against. It has been very serviceable.* The aggregate distance on which the traffic is still diverted to a temporary line is under 20 miles, exclusive of a variable distance of several miles in the Rechna, where the elevation of the original embankment is in progress and the traffic passes along the berms. The whole of the permanent line, with the exception of the five bridges specified in an earlier para., is expected to be open in 1861. In the meantime the Bullock Train travels to Peshawur, and the mail cart, in fair weather maintains a pace of 10 miles an hour along the whole distance. These facilities, however, cease with even a moderate fall of rain, which soon reduces many parts of the road, in its present unmetalled condition, to a track of deep mud.

* The following works on the road were complete on 1st January last :—

Drains of 10 feet waterway and under	336
" " " to 20 feet	39
Bridges of 20 " " 40 "	5
(Of the preceding the tunnels in 39 cases exceed 100 feet in length, of which 21 exceed 150 feet, 8 exceed 200 feet, and 3 exceed 250 feet.)	
Bridges of 40 to 80 feet	18
" 80 " 100 "	6
" 100 " 200 "	2
Total ...	406

The following had at the same date yet to be constructed :—

Drains of 10 feet and under	8
" 10 to 20 feet...	6
Bridges of 20 to 40 "	10
" 40 " 80 "	8
" 80 "100 "	1
" 100 "200 "	8
" 200 "400 "	8
" 400 "510 "	2
Total ...	51

In addition to the five bridges omitted from the sanctioned estimate, 49 metalled gaps, affording in aggregate a waterway of many thousand feet, are also in progress.

These figures will give some idea of the magnitude of the works required for a railway on this line.

198. An expenditure of a lakh of rupees for the repair of the Phillour and Beeas Road has been sanctioned. This large outlay was necessary, as the road had been neglected for some years under the impression that it would be preferable to adopt a new and somewhat shorter line; but the intention was eventually dropped, as the old line was pronounced by good judges to be the better of the two, and it was not thought expedient to incur the very heavy outlay

Repairs of the road from Phillour to the Beeas.

which the adoption of a new line would involve for the sake of saving five miles in fifty [*P. W. Dept.*] on this line of communication.

* Indus passage at Attock.

199. The improvement of the Indus passage at Attock has been the subject of various schemes.

200. Its position at the gorge of the great outpost of our western frontier, forecast of the critical importance at some future day of possessing here unfailing and defensible means of transit; the extraordinary velocity of the stream* and its liability at uncertain periods to vast and abnormal floods; the dangers of the channel; the military bearing of the adjoining shores, are all considerations which have tended to draw deserved attention to the question, and to perplex its solution.

* The Indus at its low level in February was, according to measurements then made by Major Robertson, discharging 45,000 cubic feet per second through a Channel of 440 feet in width. The surface velocity at the centre was nine miles an hour.

201. A costly but excellent bridge of boats is maintained at Attock for seven or eight months of the year.† The ferry which replaces it on the rise of the river is tedious and dangerous. A spirited attempt was made some years ago to maintain the bridge throughout the year, but it was unsuccessful.

† The block of the bridge and ferry is roughly as follows:—

	Rs.
30 bridge boats, at Rs. 5,000 each...	1,50,000
28 ferry boats, at Rs. 800 each	22,400
Superstructure	15,000
Total Rs. ...	1,87,400

and the annual cost of establishment, exclusive of depreciation or interest on the block, is Rs. 9,000.

202. Some years ago data for designing a permanent Bridge at Attock were carefully collected by Major W. A. Crommelin, now Chief Engineer in Oudh. In communication with that officer, designs for suspension and other bridges were prepared in England by Mr. Pritchard Baly, C. E., and these were submitted to Government by Major Crommelin with an able report and estimates in the latter part of 1856. The time was unfavourable for the consideration of so costly a project, and no practical result ensued.

203. In January 1859 Sir John Lawrence submitted two proposals with regard to this passage.

204. The first, which was that to which the Lieutenant Governor gave the preference, was for an experimental drift as the precursor of a tunnel under the Indus. Being submitted before specific annual assignments were made to the Local Governments at a time when financial restriction was tightest, and when the Government of India was compelled to defer all new works not of a very urgent nature, it was not sanctioned.

205. The other proposal was, that one of the steam gun-boats built for the Court of Directors in 1858, should be sent to Attock to make a trial of the probable advantages of a steam ferry boat. This was acceded to. It has proved a failure.

206. The tunnel scheme was projected by Major Alaric Robertson, of the 48th Madras Native Infantry, the present Superintendent of the Peshawur Road, and should

[*P. W. Dept.*] its execution be practicable for anything like the amount of Major Robertson's estimate, (about five lakhs,) it will meet the requirements of the passage better than any practicable bridge, and at much lower cost. The military protection of any permanent structure for the passage of the Indus is of course an essential consideration. It is one involving great difficulties at Attock. Looking to this point alone, the advantages of the tunnel project are singular. Its entrances would be easily secured, whilst the intermediate passage would require no protection.

207. Success at any such cost must be contingent on exemption from any copious influx of water whether from strong springs or from filtration through fissures in the rocky bed of the river. This can be decided only by experiment. If a drift can be carried through without encountering such an impediment, the success of a tunnel ceases to be problematical, and its cost can be accurately calculated. For the experiment Major Robertson asked Rs. 10,000, and the services of three Companies of the Punjab Pioneers.

208. Judging the investigation well worthy to be carried out, His Excellency sanctioned both concessions. The shafts on either side of the Indus have been commenced.

Proposed formation of Basins for the Circular Canal.

209. Major Strachey, of Engineers, having suggested to the Government the possibility of adapting the excavations for the bank of the Eastern Bengal Railway from Sealdah to the Dum-Dum Road towards the formation of Basins for the improvement of the Circular Canal navigation, a Committee was appointed to consider and report on the subject.

210. The subject was carefully gone into by the Committee. While admitting the necessity of shortly providing for additional accommodation for boats, the Committee came to the conclusion that the advantage offered by the adaptation of the Railway excavation was not sufficiently great or certain to warrant the adoption of Major Strachey's suggestion. The following measures were, however, recommended to be taken from time to time for meeting the pressure for additional accommodation in the Canal:—

1st. The improvement of the reach between Trimoonee and Dhappa.

2nd. The opening out of the abandoned portion of the new cut as far as the Dum-Dum Road as an open dock.

3rd. Making a dock on a site near Balleaghatta.

4th. The formation into a locked dock of the whole of the abandoned new cut as far as the Barrackpoor road.

211. The Committee at the same time recommended the purchase of a strip of land along the south side of the Dhappa reach, as well as the site of the proposed dock, and the immediate clearance of the Dhappa reach and its adaptation to receive a double row of boats. Acting on these recommendations, which were strongly supported by the Lieute-

nant Governor of Bengal, the Government of India authorized the immediate carrying [*P. W. Dept.*] out of the following arrangements:—

212. The clearance of the straight reach between Trimoonee and Dhappa, and the purchase of the adjoining strip of land.

213. The purchase of the site of the proposed docks near Balleaghatta.

214. The opening out the abandoned portion of the new canal from the new Ooltadangah cut up to the Dum-Dum road.

Proposed tramway between Roorkee or Kunkhul and Dechourie.

215. The Government of the North-West Provinces having been consulted on the practicability of constructing this tramway, and on its probable utility and financial results, stated in reply that the prospective traffic between Roorkee and Dechourie was not such as would justify any expectation of the project proving remunerative. The quantity of iron required annually in the Roorkee workshops does not exceed 1,070 tons, nor is it probable that the demand will be increased for some years, and this quantity can be conveyed from Dechourie to Roorkee by existing means of transit for Rs. 18,000. The other main export from the Kumaon District is timber; but it is hardly likely that merchants will make use of the tramway for its carriage, incurring the additional expense of Canal tolls, when they can float it down the Ramgunga free of cost.

216. Moreover, the country through which it was proposed that the tramway should pass presents great Engineering difficulties, and the consequent expense of construction would preclude expectation of a successful issue to the enterprise, regarded as an investment of capital. The line would be 120 miles in length and would run transversely to the drainage of the country. It would not only have to cross four rivers and numerous ravines, which become formidable torrents in the rains, but also four or five miles of low land on the banks of the Ganges, flooded during the monsoon.

217. These objections to the proposed line were considered decisive; but Mr. Hardy Wells who has been deputed by the Secretary of State for India to make the necessary surveys and report on the general question of tramways in Rohilkund has been desired to give the subject his consideration, as it was possible that some other line might be selected to which the above objections might not apply.

RAILWAYS.

218. THE supervision of the railways in Bengal, the North-West Provinces, and the Punjab, having been transferred to the Local Governments, it is not necessary here to notice the progress of works on the several lines, as information on this point will doubtless be embodied in the reports of those governments. It is intended in this report to notice briefly matters of general interest only, which have come before the Government of India during the year under review.

[*P. W. Dept.*] 219. The difficulty experienced in keeping up the staff of european engine drivers, induced the Government of Bengal to suggest the establishment in this country of a workshop school for training men for this particular work. The matter is one of great importance not only to the E. I. Railway, but to all Railways in India, and the other Local Governments concerned have therefore been invited to favour the Government of India with an expression of their sentiments on the subject.

Schools for training engine drivers.

220. The question of making railway stations defensible was referred to the several Local Governments for opinion, and, as was to be expected, the modes suggested by the Engineer and the other officers consulted by them were so numerous, each being probably the best for some particular locality, that the Government of India found it impracticable to devise rules so comprehensive as to meet all local requirements. The following general principles were therefore prescribed, and the details required to give them effect in each case were left entirely to the local authorities, administrative and professional :—

Question of making railway stations in India defensible.

1st. That all railway stations should be designed primarily for the convenience of traffic, and no distribution of buildings or ground permitted that would tend to impair this result.

2nd. That, traffic being thus provided for, defensive arrangements should rank next, and, so far as was consistent with the convenience of the former, buildings, &c., to be so arranged as to be mutually protective, and to be provided with such simple and inexpensive facilities for defence as will at once suggest themselves to any intelligent engineer, civil or military, whose business it is to design a railway station, with this idea in his mind.

221. The above principles will be made applicable to all railway stations.

222. The attention of the Government of India had been drawn to the danger signal invented by Colonel Barr which acts by means of electricity, the arrangement consisting of semaphores fixed at intervals of about five miles, showing by self-action to every passing train, by night or by day, whether the interval in advance has been cleared by the preceding train. After consideration of all the opinions on the design expressed both by the Government and the Railway Officers in Bombay and Bengal, the Government of India came to the conclusion that it was desirable that the signal should have a fair trial, and the Government of Bombay was requested to invite the G. I. P. Railway Co. to permit Colonel Barr to erect, at the expense of the Government, at least two of his danger signals at some fitting spot on the line.

Danger signal invented by Col. Barr.

223. After full consideration of the subject by the Governments of Madras and Bombay, Moodgul has, with the consent of the Government of India, been selected as the point of junction for the G. I. P. and Madras Railways. This Station is 14 miles from the Kistna, and is the chief place in the Raichore Doab.

Point of junction for the G. I. P. and Madras Railways.

Appendix G.
Railway accidents.

224. Annexed is a Return showing the number and nature of the accidents which have occurred on Railways in India during the year 1859. [*P. W. Dept.*]

RAILWAYS IN BENGAL.

225. With reference to the petition noted in the margin, the arguments advanced in favour of the Northern Bengal Railway Company were—

Petition from residents and settlers of Darjeeling in favour of the Northern Bengal Railway and in opposition to the Eastern Bengal Railway.

1st. That it was of the greatest moment both to Government and to themselves that railway communication with Darjeeling should be established in the shortest possible time, and this the Northern Bengal Railway Company would undertake to do.

2nd. That the line from Rajmahal viâ Maldah and Dinagepoor to Darjeeling is the main line of the Northern Bengal Railway Company, and, being connected with, the first point on the Ganges reached by the East Indian Railway, communication with the sea on the one hand and with the North-West on the other, would be secured at once and by the shortest route.

3rd. That the line was believed to be practicable and cheap, and that the Northern Bengal Railway, should operations be commenced during the year, might open, on a considerable portion of its line, about the same time as the East Indian Railway Line to Rajmahal, or shortly afterwards.

4th. That the Northern Bengal Railway Company was the first to project the lines in question on which it had spent money and much labour; that it required the shortest lengths to be constructed, and that this Company would be prepared to construct them at once.

5th. That the omission of the Rajmahal Line would be a great mistake, especially in a military point of view.

6th. That the Eastern Bengal Railway Company would have enough to do to construct its main line to Dacca and the Serajgunge Extension.

7th. That the Eastern Bengal Railway Company having been established to provide a railway for a line of country that has no connexion with Lower Bengal, it would leave communication with Darjeeling to depend on its main line being joined to the Northern Bengal Lines, which have been projected, by another Company; and that the line from Kooshtee to Dinagepoor would be a waste of power in the present state of railway communication in India.

8th. That by giving the Northern Bengal Lines to the E. B. Railway Company to construct, great delay must be involved, for the first object of that Company would be to complete its main line, and, not until the Ganges had been bridged, Dacca reached, and the long and unnecessary line from Kooshtee to Dinagepoor constructed, would the Eastern Bengal Company open a line to Darjeeling.

[*P. W. Dept.*] 226. Before receipt of this petition the Government of India had formed an opinion adverse to the views of the memorialists, and the arguments above stated failed to shake the conviction arrived at, that the undertaking should be reserved for the E. B. Railway Company. Although it was possible that the Northern Bengal Line might be sooner constructed, yet this could not be held as a conclusive consideration with Government in the selection of lines for guarantee. The Government was bound to consider, not the convenience of the next few years only, but what, on the whole, would be the best system of railways for the country. In this view the Eastern Bengal Railway had the strongest claim. A bridge over the Ganges at Kooshtee formed part of the scheme of that Railway; and a line to Dinagepoor and Northern Bengal might it was thought advantageously start from that point. As far as Dinagepoor and Rungpoor, then, the line fell naturally within the field of the Company which had to construct the bridge and connect Kooshtee with Calcutta. And a line from Dinagepoor to Darjeeling was a natural extension of that line from the bridge to Dinagepoor.

227. The petitioners were also, it was believed, mistaken in their estimate that the Northern Bengal Railway would be the shortest line to the sea. It would probably be longer by some 30 miles. Moreover, they appeared to have overlooked its great difficulties. It would cross heavy drainage lines, and would have a most unpromising terminus opposite Rajmahal, whereas the Eastern Bengal Line will have the advantage of running parallel to the natural drainage of the country.

Railway feeders in Bengal and the N. W. Provinces.

228. The completion, simultaneously with the opening of the railways themselves, of roads communicating with railway stations is a subject to which much importance is attached by the Supreme Government, and which obviously demanded early attention. It was, therefore, thought desirable to obtain from the Governments of Bengal and the N. W. Provinces special reports shewing the existing means of communication with open portions of the E. I. Railway, and the roads proposed in connexion with the remainder.

229. The reports submitted by both Governments show that the subject has received the consideration which its importance deserved. Several roads leading to railway stations have either been already constructed or are in course of construction at the cost of local funds, while a few of the larger class of feeders are being constructed at the cost of the State. The want of funds alone prevents the speedy completion of these communications, without which the resources of the rich tracts of country bordering on lines of railway must remain undeveloped.

Proposal for bridging the Hooghly, and so connecting the E. I. Railway with the other lines from Calcutta.

230. So far back as November 1858 it was suggested by Mr. Turnbull, Chief Engineer, E. I. Railway, that the best means for effecting a junction between that railway and the other lines from Calcutta would be by bridging the Hooghly at Pulta Ghat, whence a branch line might join the Eastern Bengal Railway at Barrackpoor. No immediate action was taken on this proposal, but in October 1859 it was referred to the

Government of Bengal for report, and received the cordial support of the Lieutenant Governor, who considered the scheme an admirable one, placing, as it eventually would, Dacca, Serajgunge and the Mutlah Port in uninterrupted railway communication with Delhi, Bombay and Madras. [*P. W. Dept.*]

231. As regards the site of the bridge, the Government of Bengal was of opinion that any point from Pulta to the neighbourhood of Hooghly, where the Railway turns to the westward, would answer so far as the junction was concerned, but that it was necessary, in order to select the best site, that the river between those points should be carefully examined. An arrangement has since been made with the Agent of the East Indian Railway Company, to make the necessary surveys, both for the proposed bridge and for the branch line to connect the East Indian with the Eastern Bengal Railway.

Extension of the E. I. Railway from Raneegunge to the banks of the Burrakur and up the Singarrun Valley.

232. In April 1858 the Board of Directors of the East Indian Railway forwarded to their Agent in Calcutta a memorial from several proprietors of coal mines in the Raneegunge District, setting forth that if the railway should be carried on from Raneegunge to some point on the Grand Trunk Road near the junction of the branch road to Raneegunge, they would engage to send all such coal as might be intended for the Calcutta market by the Railway alone, and would agree to pay for its transport the ordinary rate per mile for the full distance the coal might be conveyed. The Board forwarded also a separate letter from East Indian Coal Company, one of the parties to the above memorial, stating that if their principal mines should be put in direct Railway communication with Calcutta, they would guarantee the despatch by Railway of 200 tons of coal daily for 21 years, paying for that quantity, whether dispatched or not, at the rate charged to the public generally.

233. Prior to this a proposal was submitted to Government by the Agent of the East Indian Railway Company, to construct a branch line from the terminus at Raneegunge to the Searsole colliery, distant about 1½ miles, owned by Gobindpersaud Pundit, by whom the cost was to be eventually repaid. This proposal, which amounted in fact to a scheme for making a private railway under cover of the power conferred by law for the purpose of making public railways, was rejected by the Government; but it was, at the same time, intimated to the Agent that an extension of the line westward might be worthy of consideration, especially if the new line could be made available for the purpose of carrying the general traffic further in that direction, while it should run near so many collieries as to be rendered certainly remunerative.

234. Attention, moreover, having been drawn to the general subject of opening out collieries, it seemed that a branch line could be constructed without any material difficulty, by which several would be directly benefitted. Such a branch might run up the valley of the Singarrun along the course of which lie all the principal coal mines now being worked, except those at Searsole and those of the Bengal Coal Company. This branch, seven miles long, might leave the main line of railway about six miles from the Ranee gunge terminus.

[*P. W. Dept.*] 235. In coming to the conclusion that the above branch would be a proper one to construct, with a view to affording facilities to a great number of coal proprietors for bringing their produce to market, and thus lowering the price of this article, it appeared to the Government that the time had arrived for considering the question of the extension of the Main Colliery Line throughout the Coal District, or at all events as far as the Burrakur River, on both sides of which near its confluence with the Damoodah it was known that very rich seams of coal had been opened out. There is reason to believe that the whole tract the line would traverse is underlain by coal.

236. The Government of India therefore ordered trial surveys to be commenced both for the branch line and the main line extension, and Mr. Oldham, the Superintendent of the Geological Survey, was at the same time directed to make a careful examination of the country, with a view to determining the probable extent of the coal fields, and the positions where the mineral is found in greatest abundance and of the best quality.

237. The Reports received from the Railway Company's Chief Engineer and Mr. Oldham quite bore out the preconceived opinion, that both lines might be most advantageously carried out.

238. In his Report Mr. Oldham noticed the vast increase in the production of coal from these fields since his first visit in 1851-52, and he remarked that his examination had placed beyond doubt the fact that there is abundance of coal in the field to meet the demand for years. He strongly urged the construction of a branch along the Singarrun Valley as far as the Chowkeydanga Colliery, which would lead to Bahrool, the locality so favourably reported on by Mr. D. Smith as a site for iron works. He also recommended the continuation of the main line from Raneegunge along the Valley of the Nooneah (in which lies one group of coal mines) nearly to the Burrakur, preferring this route to one leading direct to the group of mines near the confluence of the Burrakur and Damoodah.

239. These opinions coincided with those of the engineer authorities whose reports showed that the Singarrun Branch Line ending at the Chowkeydanga Colliery would be 7½ miles in length and including an addition of two miles of doubling the main line, would cost Rs. 4,06,655, including terminal buildings. For the main extension three alternative lines were surveyed, but that by the Nooneah Valley was recommended. This line, which is somewhat more than 22 miles to the bank of the Burrakur, will, it is estimated, cost Rs. 15,31,740.

240. These additional lengths have been sanctioned.

241. It was not recommended that the extension should be carried across the Burrakur but in all reports submitted on the subject, allusion was made to the eventual continuation, of this line to form a more direct communication with the N. W. Provinces than the river line affords. Both Mr. Turnbull, the Railway Company's Chief Engineer, and Professor Oldham are of opinion that such a line should strike the Ganges at Patna; bringing that city 100 miles nearer Calcutta than by the other route, and avoiding a second

crossing of the Soane, while it would open up the Kurhurbalie coal fields, whence coal would be conveyed to the river's edge at Patna, and those parts of the river would thus be supplied which are farthest removed from present sources of coal, or any that are likely to be otherwise available. [*P. W. Dept.*]

242. The line to the Burrakur will be so laid out as to form part of the main line to the Ganges, in the event of such an extension being ultimately made.

243. In laying out the lines in the mineral districts care will be taken to meet the requirements of all the mining interests, and as far as possible to place all upon an equal footing as regards accommodation.

Fatal accidents on the E. I. Railway.

244. The increasing number of fatal accidents on the East Indian Railway rendered it absolutely necessary that more stringent regulations should be adopted, in order to enforce greater care on the part of the Railway Company's servants. The serious attention of the Government of Bengal was, therefore, invited to the subject, and it was remarked that there was reason to fear that there was not sufficient alacrity and determination on the part of Magistrates in holding inquests and in inflicting punishments. It was suggested that the evil might be checked if railway officials, who are British born subjects, were sent up to the Supreme Court for trial on a charge of manslaughter in cases where it appeared, on the Magistrate's examination, that the loss of life was caused by a neglect of duty on their part.

245. It was subsequently reported by the Government of Bengal that the Railway Company had issued a circular, and had promised to do all in their power to enforce its requirements with the object of remedying the evil. Orders had also been issued by the Local Government to the Magistrates along the line of Railway, enjoining the necessity of making prompt and careful inquiry into all accidents which might occur within their jurisdictions, and for prosecuting railway officials whenever an accident was traceable to the neglect of ordinary precaution on their part.

Condition of fences along the line of the East Indian Railway in Bengal.

246. The attention of the Government having been drawn to the condition of the fences along the line of the East Indian Railway in Bengal, enquiries were made on the subject, when it was ascertained that the fences were incomplete in many places, and that the railway Chief Engineer, with whom the responsibility of keeping them in efficient condition rested, had long been aware of the fact. The wooden fences required almost entire renewal, and there was apparently an unwillingness to incur the expense because of the difficulty of protecting them from the natives, who carried off portions whenever they had an opportunity of doing so unperceived.

247. By Act XVIII. of 1854, a Justice of the Peace is empowered to fine a railway company for every case of non-compliance with an order from himself to repair a fence, and there was no doubt that if the provisions of the Act were rigidly enforced, more energetic measures would be taken to fence the line securely.

[*P. W. Dept.*] 248. With this view the attention of the Government of Bengal was called to the necessity of urging magistrates to use their legal powers to compel attention from the Railway Company and its servants, and to quicken their efforts in this essential matter, while the Government Consulting Engineer was directed at the same time strongly to assert the responsibility of the Chief Engineer for the efficient condition of the fences.

249. It is proposed by the railway officers to use iron wire for fences, which though expensive is durable.

Construction of a permanent branch line of railway from the Jumalpoor station of the East Indian Railway to the Ganges at Monghyr.

250. The construction of this branch was sanctioned after communication with the Home authorities.

251. The first object of this branch is to facilitate the conveyance of permanent way materials, iron-work for the Hullohur and Keeul Bridges, and the heavy machinery, &c., for the large workshops at Monghyr. For this purpose a temporary branch would certainly have sufficed, but Chief Engineer, was of opinion that the branch would afford ready and cheap means of communication with the Ganges for country produce and for passengers; that, in fact, it would be wanted for general traffic.

252. Monghyr is in itself a large and important place of ancient note and considerable influence, having very considerable local traffic, and there is little doubt the branch line will benefit trade and bring traffic to the main line.

253. This branch will, it is estimated, cost Rs. 3,10,125 exclusive of the value of the land.

Over-crowding of 3rd class carriages on the East Indian Railway.

254. Complaints having not unfrequently been made of the practice of over-crowding 3rd class carriages on the East Indian Railway, the Consulting Engineer was directed to ascertain whether proper care was taken by the Traffic Department to do away with all just cause of complaint on this score. From his report the Government were gratified to find that the railway officers had done all that they could personally do to prevent the evils complained of; and the absence, latterly, of complaints go far to prove that their efforts had not been unsuccessful.

255. It was observed, however, from the Consulting Engineer's Report that a width of 15½ inches only was allowed as sitting room for each passenger, a space certainly much too scanty for passengers of any class. It was subsequently increased to 17 inches. This is still considered insufficient, and 20 inches have been fixed as the standard.

Failure of cast iron sleepers on the East Indian Railway.

256. Sleepers of cast iron were, on the recommendation of the late Mr. Rendel, laid, experimentally, on about 20 miles of the East Indian Railway. For a time after the opening of the line the road stood very well owing, probably, to the comparatively slow speed of

trains; but when the express mail trains and heavy coal trains began to pass over it, breakage of the sleepers increased so much that it was deemed expedient to remove them altogether and substitute wooden ones. [*P. W. Dept.*]

257. The quality of the metal was reported to be good. The breakage was attributed to unevenness in bedding, &c., but the fact was that the sleepers were too weak for the strain to which they were subjected.

258. This failure was much to be regretted; as, with the prospect of having native cast iron, the use of sleepers of that material of sufficient strength would be very beneficial, both as securing durability, which would, in the end, produce great saving, and in sparing the saul and teak forests from the insatiable demands of the railways.

259. This latter point is one of no small moment, and is perhaps not sufficiently appreciated. Whatever benefit may result by putting the forests under proper conservancy, the demand on account of construction and renewal of railways has produced, and will continue to produce, a great rise in the price of good timber accompanied by increasing difficulty in procuring it from accessible tracts. Believing, as the Government did, that the use of cast iron for sleepers, could a pattern of moderate weight be found suited to bear rapid and heavy trains, would be a great economy in the end as regards the railway itself as well as a great relief to all the other public works of the country, it was recommended to the Home Government to obtain the best professional advice on this matter, in conjunction with the Railway Boards.

260. This suggestion was acted upon and resulted in the following resolution arrived at in England by the Consulting Engineers of the several Indian Railways:—

1st. That a road consisting of rails laid on any cast iron sleepers yet devised, instead of upon transverse or longitudinal sleepers, is inferior as respects the ease of motion of trains when high speeds are adopted, and may be expected to increase the wear and tear of the rolling stock as well as of the road itself; but, where the ballast is suitable, and for the sake of economy, or to hasten the completion of works in countries or districts similar to some portions of India where wooden sleepers are not readily procurable, there may be cases in which cast iron sleepers should be applied.

2nd. That it is undesirable to fix authoritatively any precise form of cast iron sleeper.

Extension of the Eastern Bengal Railway.

261. Attention having been drawn by the Government of Bengal to the importance of an immediate and complete survey of the country beyond the Ganges through which the proposed extension of the Eastern Bengal Railway to Naraingunge, with a branch line to Serajgunge would run, a reference was made to the Home Authorities on the subject, and the necessary surveys were subsequently undertaken by the Railway Company.

262. Sanction was accorded by His Excellency the Governor General to the construction of a branch to connect the main line of the East Indian Railway at Cawnpoor with a wharf on the Ganges at that place.

Connection of the Main Line of the E. I. Railway at Cawnpoor with a Wharf on the Ganges at that place.

263. The object of this branch is to intercept the river trade where the railway in its upward course last approaches the Ganges. It was not found practicable when the main line was first laid out to carry it near the river bank, and the connexion subsequently sanctioned had always been contemplated.

264. The question of the direction to be given to the railway from Etmadpoor towards Delhi was submitted for the decision of the Government of India.

Direction of the E. I. Railway from Etmadpoor towards Delhi.

265. The direct line from Etmadpoor to Allyghur was open to the objection that it passed four or six miles from Hattrass a populous commercial town. The additional length of line that would be required to reach the town was stated to be one and a half miles, and the additional cost £12,000.

266. Hattrass contains about 25,000 inhabitants and is the centre at which produce from Rohilcund and from west of the Jumna is collected and exchanged. The chief line of Hattrass traffic is across and not along the Doab, and will, it is believed, be little affected by the railway. It was urged on the one hand that it was not worth while to increase the length of the line merely for the convenience of the inhabitants of the town, while on the other hand it was argued that, as a general rule, a railroad should touch as many towns as possible, both to give the country the greatest good, and to give the rail the greatest amount of traffic.

267. The Government of India was of opinion that in this case no sufficient cause had been shown for diverging from the straight line. On one side was the convenience of the inhabitants of a single town, on the other the inconvenience of every passenger and the increased cost of every ton of goods put on the Rail, besides an additional expense of £12,000 on the whole line. It was therefore determined to adopt the direct line from Etmadpoor to Ghazeeoodeennuggur viâ Allyghur.

268. These fires, which were at one time very frequent, arose from the use of wood fuel, and have since been checked by the introduction of American Chimnies, and "Bafflers" or perforated plates, inserted in the Engine smoke-box.

Claims for compensation for losses of property by fire on the Railway between Allahabad and Cawnpoor.

269. The claims for compensation for property destroyed were heavy. The Agent of the East Indian Railway Company denied the liability of the Company to reimburse the sufferers, because the accidents arose from causes over which he possessed no control, and because the line was opened solely for the use and convenience of the Government, and

before the Company would have opened it to the public for their own profit. This view [*P. W. Dept.*] was contested by the Government officers, who maintained that the precautions, since successfully adopted, might have been resorted to at an earlier stage, and that this was not done was attributable to the shortcomings of the Railway Company and their Locomotive Superintendent.

270. The question was one of much difficulty, and was therefore referred to the Advocate General, acting on whose advice the Local Government was directed to dispose of the claims on the principles laid down in the Resolution of 17th May 1859, which will be found in the Appendix.*

* Appendix H.

271. This subject did not appear to the Government of India to have received that consideration which its importance deserved. The Singrowlee Coal Field is the only one probably which affords any prospect of being made available prior to the opening of the Jubbulpoor line of railroad; and it was to be feared that the supply of wood fuel, unless put under some system, would speedily become a difficulty. The demand, it was believed, was already leading to injurious denudation of the Doab, and it appeared very desirable at once to ascertain with some precision what jungle tracts were available for the supply, and to consider it could not be put under some regulation such as would allow of the renewal of growth. The matter was therefore brought prominently to the notice of the Government of the North-Western Provinces; and Mr. Oldham, Superintendent of the Geological Survey, was at the same time invited to submit his views on the subject.

Fuel for railways in the N. W. P.

272. Valuable Reports from Mr. Oldham and from the local officers were duly received, but the opening of the East Indian Railway to Rajmahal (to which place Raneegunge Coal can be brought at a price not greatly exceeding the price at Howrah) sufficed to remove all doubt as to the practicability of getting coal in the North-Western Provinces at a cost which will cause it to supersede wood at its present or even at a slightly enhanced cost.

RAILWAY, PUNJAB.

273. The important question of the direction of a line of Railway between Delhi and Lahore has not yet been finally decided. The line originally preferred (in 1855) was thedirect one from Delhi viâ Ferozepoor. The preference was mainly founded on the following considerations:—

Route of the Railway between Delhi and Lahore.

1st. The great excess of cost assigned in the Estimates to the more circuitous line by Umballah.

2nd. The advantage of directness as bearing on the cost of through traffic of goods.

3rd. The convenience of the Ferozepoor Arsenal.

274. On the other hand, the line by Umballah, Loodianah, Jullunder and Umritsur, though circuitous, was strongly supported by Sir Robert Napier, Major Greathed, and Mr.

[*P. W. Dept.*] Brunton, Chief Engineer, Punjab Railway, and the adoption of this line in preference to the other was recommended by the Punjab Government in October 1859 on various grounds, among which the following may be mentioned :—

275. Although more circuitous, this route follows the long established course of traffic; it would connect the great military stations; it would pass through the most fertile part of the country; and would receive all the trade from the Himalayahs. Its adoption would, however, necessitate the erection of bridges over the Sutlej and Beas instead of a single bridge over the former after its junction with the latter, as would be the case in the Ferozepoor Line.

276. As regards the line viâ Ferozepoor, the importance of directness, as bearing on the cost of through carriage of goods, was, in 1859, considerably less than it was in 1855; as the construction of a railway to Mooltan and of another in Sindh, with the concomitant improvement of navigation on the Indus would direct the chief export and import traffic of the Punjab by the line of the Indus and Kurrachee, and not by the line of Delhi and the Ganges. The Government of India was therefore disposed to give full weight to the advantages of carrying the line through important stations and populous districts. Still the question of comparative cost was not one to be altogether disregarded.

277. The great excess of cost assigned to the line by Umballah and Jullunder in the original Estimate was disputed; and Mr. Brunton gave it as his opinion that if part of the Grand Trunk Road were made over to the Railway Company, that line could be completed at less cost than any other.

278. The Government of India was not, however, prepared to accept this opinion without more precise comparison; for which further evidence was necessary. It was not satisfactorily shown that the conclusions regarding Hurreekee as a site for the passage of the Sutlej should be abandoned, and it was not to be disputed that one well selected crossing of rivers after their union in one channel is, *a priori*, likely to be far more economical than separate crossings of the confluent streams, especially when the conditions are such as those of the Sutlej and Beas.

279. As regards the Ferozepoor Arsenal, its existence at a point which has ceased to have strategic importance, was unfortunate. But the fact of its existence and of the great expenditure that has taken place on it could not be ignored in the discussion. Any line crossing at Hurreekee would be within a moderate and not very inconvenient distance from the Arsenal, while the adoption of a line through or above Jullunder would render the abandonment of the Arsenal inevitable.

280. The Government of India did not think that the direct line contemplated in 1855 should be adhered to merely for the sake of the Arsenal, but was certainly of opinion that if a single bridge at Hurreekee should still prove to be the most economical and suitable mode of crossing the waters of the Sutlej and Beas, that crossing would have much to recommend it for the sake of the Arsenal in addition to its own merits.

281. In addition therefore to the survey ordered by the Punjab Government of a section of the road and adjoining country from Delhi to a point near Loodianah, and between Loodianah and the Beas viâ Jullunder, the Government of India directed the survey of a line passing through Umballah and Sirhind, and thence, or from such other more advanced point on the Trunk Road line as might be most suitable, to Hurreekee and Umritsur. [*P. W. Dept.*]

282. It was at the same time directed that such investigations of the sub-soil and waterway of the rivers should be made as would enable the engineers to prepare some comparative estimates of the single and double passage.

Provision for the passage of irrigation cuts from the Baree Doab Canal across the Punjab Railway line.

283. In communicating to the Punjab Government the decision of the Government of India on the position, &c. of the chief stations of the Punjab Railway, the attention of that Government was drawn to the necessity for making provision for the eventual passage of irrigation cuts from the Baree Doab Canal. It was feared that it was too late to do this in the portion of the line below Lahore; but above Lahore, where early irrigation from the Canal was expected, it was advisable that an endeavour should be made at once to provide for as many of the chief distributing channels as would cross the railway; for, if deferred till the line was open, it would obviously give rise to great difficulties and complicated questions. The matter had not been overlooked. But it was thought desirable to press its importance on the Punjab Government.

APPENDIX A. [*P. W. Dept.*]

From Lieut. Col. H. Yule, Secy. to Govt. of India, P. W. Dept., to Local Govts. and Administrations, Nos. 2899—2908, *dated 5th May* 1859.

In continuation of this Department's Circular No. dated 17th July 1857, the following Proceedings and Resolution are circulated, containing the decisions of Government as to whether the audit of charges by Chief Engineers and Commissioners should be final, and as to the mode in which charges so audited are to be shown up in the Public Accounts.

No. 2389.

Accountant General's Report to Financial Secretary.

Under Circular from the Public Works Department, dated as above, the audit by the Commissioners of Civil Divisions, or Officers holding analogous posts, of expenditure to the extent of Rs. 500 on account of public works disbursed by Officers not of the Department, was evidently intended to be a final audit; and there seems to be no reason for modifying the rule, nor can there be any objection to the Inspector of Jails being invested with the same powers as those exercised by the Commissioners of Revenue in such cases.

The audit of fixed periodical expenditure sanctioned by Government, as for instance, for the annual repairs of Moonsiffs' Cutcherries and for repairs of Thannahs, would be regulated by the character of the charge; if they are viewed as contingencies of the Department recurring annually and met by an allowance sanctioned by Government for the purpose, they should be audited by the Civil Auditor and charged to the Department incurring the expenditure; but if they are considered Public Works charges, the audit of the local Commissioner would be sufficient for their adjustment to that Department.

Financial Department, 25th March 1859.

The Governor General in Council agrees generally in the view taken by the Accountant General, and is pleased to decide that in respect to charges passed by Commissioners under the rule of the Public Works Department, a second audit by the Civil Auditor is unnecessary.

His Excellency in Council also determines that the Inspector of Prisons has the power, under the orders of July 1857, of passing charges under Rs. 500 in the Jail Department, and that his audit is to be final.

The question whether charges within the limit of Rs. 500 for annual repairs of Moonsiffs' Cutcherries and of Thannahs should be treated as Judicial charges, or more correctly as not being Public Works charges, and therefore as charges auditable by the Civil Auditor, or as Public Works charges, and therefore as auditable by Commissioners, will be decided in the Public Works Department.

[*P. W. Dept.*] *Public Works Department.*

WITH reference to the proceeding, the Governor General in Council remarks that, before this Department's Circular of 17th July 1857 was issued, charges of this nature were inserted in the Office Contingent Bill audited by the Civil Auditor; but as that Officer is no longer to audit charges for work executed, and as it seems desirable to keep the accounts of all charges connected with the maintenance of public buildings distinct instead of mixing them up with all the miscellaneous charges of Office Contingent Bills, the Governor General in Council directs that these contract allowances shall for the future be audited by the Chief Engineer, or by the Commissioner, as the case may be, under the Circular of 17th July 1857, and that they shall be booked as Public Works charges.

APPENDIX B.

RETURN OF SANCTIONED PUBLIC WORKS EXPENDITURE FOR 1859-60,

Compared with the Extent, Population, and Revenue of the several Local Governments of India.

GOVERNMENTS.	Particulars.	Area in Square Miles.	Population.	£ Total Revenue.	£ Land Revenue.	EXPENDITURE, £ — Original Works. Military Buildings.	Original Works. Civil Buildings.	Repairs. Agricultural Works.	Repairs. Communications.	Repairs. Miscellaneous Public Works.	Repairs. Total.	Establishment Charges.	Reserved for unforeseen Emergencies.	Grand Total.
Madras	Total	136,878	22,301,692	6,181,190	4,169,354	120,000		31,500	55,200	300	210,000	170,000	... ...	870,000
	Per square mile	1	170	45·16	30·46		·877	·230	·403	·002	1·535	1·242	... ...	6·355
	Per million souls	5,892	1,000,000	265,947	179,376		5,159·978	1,352·941	2,376·848	12·935	9,052·912	7,309·953	... ...	38,284·115
	Per £100 of Total Revenue ...	2·21	358	100	67		1·942	·508	·893	·005	3·396	2·753	... ...	13·824
	Per £100 of Land Revenue ...	3·29	561	148	100		2·899	·759	1·337	·007	5·072	4·105	... ...	20·179
	Proportion of the whole ...	...	...	...	...		·98	·04	·09	... ...	·02	·04	·01	1·00
Bombay	Total	140,407	11,587,654	6,153,671	2,929,329									
	Per square mile	1	84	43·82	20·9									
	Per million souls	11,994	1,000,000	521,308	249,750									
	Per £100 of Total Revenue ...	2·3	188	100	47					NO RETURN				
	Per £100 of Land Revenue ...	4·10	400	212	100									
	Proportion of the whole ...													
Bengal and Fort William ...	Total	253,000	40,852,397	10,440,702	3,717,992	141,900	38,200	11,700	29,700	5,400	228,900	15,000	19,100	30,000	44,610	500	110,000	70,000	41,100	450,000
	Per square mile	1	161	41·3	14·7		·15	·046	·113	·021	·902	·059	·075	·118	·177	·002	·434	·276	·162	1·774
	Per million souls	6,231	1,000,000	255,579	91,004		934·677	286·714	726·803	132·203	5,602·564	366·48	467·472	732·953	1,090·978	12·237	2,692·611	1,712·984	1,006·211	11,013·632
	Per £100 of Total Revenue ...	2·44	391	100	35		3·591	·111	·284	·051	2·192	·144	·183	·287	·426	·004	1·053	·670	·394	4·317
	Per £100 of Land Revenue ...	6·77	1,098	277	100		3·767	·309	·799	·142	6·17	·4	·505	·797	1·199	·011	2·961	1·893	1·084	12·092
	Proportion of the whole ...	...	...	...	...		·03	·03	·06	·01	·18	·04	·05	·07	·09	... ...	·23	·14	·09	1·00
N. W. Provinces	Total	109,000	30,250,000	6,639,189	4,212,505	390,000	17,500	32,000	54,000	4,000	509,000	50,000	24,000	55,000	45,000	10,000	150,000	100,000	50,000	800,000
	Per square mile	1	278	61·24	38·56		·161	·294	·497	·037	4·674	·459	·221	·504	·414	·092	1·377	·919	·459	7·343
	Per million souls	3,571	1,000,000	219,514	141,795		578·512	1,057·743	1,785·714	132·142	16,833·141	1,653·263	793·657	1,817·162	1,487·744	330·571	4,959·589	3,305·071	1,652·536	26,450·351
	Per £100 of Total Revenue ...	1·65	456	100	64		8·724	·527	·814	·06	7·641	·542	·361	·828	·677	·15	2·258	1·505	·752	12·039
	Per £100 of Land Revenue ...	2·58	712	158	100		13·611	·824	1·272	·095	11·792	·847	·569	1·292	1·057	·234	3·526	2·354	1·178	18·84
	Proportion of the whole ...	...	...	...	...		·49	·03	·04	... ...	·43	·03	·02	·04	·04	·01	·12	·08	·04	1·00
Punjab	Total	90,258	14,913,801	2,892,022	1,286,386	134,200	10,700	117,000	92,500	1,900	376,300	18,900	450	11,300	14,700	150	45,500	92,200	50,000	564,000
	Per square mile	1	165	32	14·2		1·2	·13	1·029	·021	4·169	·209	·004	·125	·162	·001	·504	1·021	·554	6·24
	Per million souls	6,063	1,000,000	193,898	86,236		8·044	7·847	6,196·339	127·472	25,219·181	1,266·981	30·183	757·859	985·678	10·06	3,050·676	6,177·81	3,353·515	37,811·187
	Per £100 of Total Revenue ...	2·12	515	100	45		13·013	4·051	6·396	·065	13·001	·653	·015	·391	·508	·005	1·572	3·184	1·728	19·501
	Per £100 of Land Revenue ...	4·8	732	135	100		29·274	8·974	13·714	·14	27·962	1·4	·034	·839	1·101	·011	3·403	6·889	3·741	42·206
	Proportion of the whole ...	...	...	...	...		·23	·07	·09	... ...	·67	·04	... ...	·01	·02	... ...	·08	·17	·09	1·00
Oudh	Total	23,000	5,000,000	600,197	385,712									
	Per square mile	1	209	24	16·42									
	Per million souls	4,600	1,000,000	120,039	77,142					NO RETURN				
	Per £100 of Total Revenue ...	4·16	833	100	64									
	Per £100 of Land Revenue ...	6·67	694	172	100									
	Proportion of the whole ...													
Nagpore	Total	76,452	4,650,000	408,656	293,704	10,000	2,500	... ...	1,800	... ...	23,900	900	1,200	... ...	2,270	1,000	5,500	15,200	15,400	60,000
	Per square mile	1	61	5·34	3·84		·03	... ...	·023	... ...	·311	·011	·015	... ...	·029	·012	·072	·198	·201	·780
	Per million souls	16,201	1,000,000	87,850	62,850	4,302·257	459·456	... ...	377·688	... ...	4,609·002	189·327	276·689	... ...	479·569	239·134	1,147·538	3,245·903	3,290·061	12,750·893
	Per £100 of Total Revenue ...	19·52	1,142	100	72	4·668	·625	... ...	·45	... ...	5·724	·206	·318	... ...	·543	·240	1·318	3·639	3·754	14·636
	Per £100 of Land Revenue ...	26	1,586	138	100	6·703	·729	... ...	·587	... ...	8·019	·269	·414	... ...	·704	·307	1·713	4·723	4·879	20·256
	Proportion of the whole ...	...	...	...	...	·08	·02	... ...	·01	... ...	·19	·01	·01	... ...	·02	·01	·04	·12	·12	1·00
Pegu	Total	36,750	6,00,253	458,159	120,848	23,400	21,100	300	... ...	6,000	60,800	12,500	2,100	... ...	5,100	3,700	23,400	13,000	13,200	125,000
	Per square mile	1	16	12·46	3·287	·636	·574	·007	... ...	·163	1·654	·339	·057	... ...	·138	·100	·636	·353	·359	3·398
	Per million souls	99,801	1,000,000	841,994	344,115	39,957·69	35,159·948	840·336	... ...	7,353·949	72,401·932	14,979·966	2,500	... ...	6,059·028	4,390·251	28,000	17,922·077	24,370·824	148,801·598
	Per £100 of Total Revenue ...	7·31	210	100	28	7·957	4·054	0·05	... ...	2·324	13·41	2·937	·492	... ...	1·123	·864	5·423	3·013	3·778	24·74
	Per £100 of Land Revenue ...	27·98	711	385	100	19·353	17·9	·25	... ...	4·962	57·415	12·563	2·1	... ...	4·827	3·713	23·912	13·778	16·781	106·278
	Proportion of the whole ...	...	...	...	...	·07	·17	... ...	... ...	·05	·29	·12	·02	... ...	·04	·04	·22	·13	·13	1·00
Tenasserim and Martaban Provinces.	Total	36,000	814,270	149,083	45,105	6,000	2,500	... ...	1,200	500	11,200	3,500	900	... ...	... ...	200	4,600	2,500	1,900	20,000
	Per square mile	1	23	4·14	1·254	·167	·069	... ...	·033	·013	·311	·097	·025	... ...	... ...	·005	·131	·07	·05	·554
	Per million souls	227,050	1,000,000	832,253	281,990	37,037	15,625	... ...	7,500	3,125	70,000	21,875	5,625	... ...	... ...	1,250	28,750	15,625	11,875	125,000
	Per £100 of Total Revenue ...	27·34	545	100	30	4·021	1·675	... ...	·804	·335	7·508	2·345	·603	... ...	... ...	·134	3·082	1·675	1·273	13·401
	Per £100 of Land Revenue ...	90·6	1,806	333	100	13·297	5·545	... ...	2·661	1·108	24·836	7·756	1·995	... ...	... ...	·443	10·199	5·545	4·213	44·326
	Proportion of the whole ...	...	...	...	...	·02	·06	... ...	·03	·01	·17	·07	·02	... ...	... ...	... ...	·09	·06	·04	1·00
Straits	Total	1,375	292,540	132,092	... ...	33,800	16,000	50	250	... ...	50,100	700	1,500	1,500	... ...	200	3,900	6,000	2,900	63,900
	Per square mile	1	213	96·06	... ...	24·58	11·636	·036	·181	... ...	36·436	·509	1·09	1·09	... ...	·145	2·835	4·363	2·109	46·498
	Per million souls	7,852	1,000,000	451,708	... ...	115,550·56	54,695·673	170·988	854·785	... ...	171,301·246	2,392·476	5,127·6	5,127·6	... ...	683·76	13,331·958	20,513·14	9,917·616	218,470·035
	Per £100 of Total Revenue ...	1·16	229	100	... ...	26·503	12·547	·037	·196	... ...	39·283	·548	1·176	1·176	... ...	·156	3·056	4·705	2·274	50·118
	Per £100 of Land Revenue ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Proportion of the whole ...	...	...	...	...	·54	·25	... ...	... ...	... ...	·79	·01	·02	·02	... ...	... ...	·06	·11	·04	1·00
Coorg	Total	2,116	183,690	78,162	13,536									
	Per square mile	1	84	11·99	6·3									
	Per million souls	11,525	1,000,000	180,241	46,457					No return passed on Budget.				
	Per £100 of Total Revenue ...	9·41	238	100	62									
	Per £100 of Land Revenue ...	15·17	1,384	232	100									
	Proportion of the whole ...													
TOTAL BRITISH ...	Total	933,010	132,297,368	34,026,564	17,884,629									3,532,355
	Per square mile	1	142	37·64	19·16									4·018
	Per million souls	6,916	1,000,000	257,199	135,202									27,720·948
	Per £100 of Total Revenue ...	2·61	387	100	52									10·377
	Per £100 of Land Revenue ...	5·03	744	192	100									20·023
	Proportion of the whole ...													1·00
Assigned Districts ...	Total	24,500	1,972,291	617,554	311,291	10,000	14,400	2,500	6,600	300	33,800	800	800	1,100	500	200	2,900	11,300	5,800	53,000
	Per square mile	1	81	25·19	12·7	·408	·586	·101	·268	·012	1·375	·032	·032	·044	·02	·008	·116	·46	·236	2·154
	Per million souls	12,648	1,000,000	313,280	158,178	5,067·027	7,297·967	1,267·595	3,345·022	152·025	17,129·614	405·471	405·471	557·351	253·415	101·366	1,469·574	5,727·074	2,939·279	26,855·394
	Per £100 of Total Revenue ...	3·97	322	100	50	1·624	2·338	·405	1·086	·048	5·473	·129	·129	·178	·079	·032	·461	1·83	·938	8·571
	Per £100 of Land Revenue ...	6·01	487	151	100	2·45	3·534	·613	1·642	·073	8·29	·194	·194	·268	·119	·048	·698	2·773	1·414	12·982
	Proportion of the whole ...	...	...	...	...	·19	·27	·05	·13	... ...	·64	·02	·02	·02	·01	... ...	·06	·21	·09	1·00
Mysore	Total	30,885	3,738,977	870,340	607,419	... ...	2,300	3,100	7,200	500	13,600	... ...	1,500	23,400	13,100	... ...	40,000	25,500	2,000	81,000
	Per square mile	1	121	28·7	19·66	... ...	·074	·1	·233	·016	·439	... ...	·048	·757	·424	... ...	1·294	·825	·064	2·622
	Per million souls	8,264	1,000,000	232,799	162,479	... ...	615·27	829·047	1,925·036	133·734	3,639·823	... ...	401·283	6,259·109	4,041,223	... ...	10,694·278	6,819·017	529,952	21,653·469
	Per £100 of Total Revenue ...	3·46	431	100	69	... ...	·264	·356	·826	·057	1·562	... ...	·172	2·689	1·505	... ...	4·594	2·929	·229	9·317
	Per £100 of Land Revenue ...	5·01	618	143	100	... ...	·379	·511	1·185	·082	2·243	... ...	·246	3·874	2·164	... ...	6·624	4·223	·329	13·417
	Proportion of the whole ...	...	...	...	...	... ...	·03	·04	·09	·01	·17	... ...	·01	·29	·16	... ...	·49	·31	·02	1·00
GRAND TOTAL ...	Total	959,562	136,069,386	35,529,258	18,062,423									3,746,386
	Per square mile	1	142	37	18·9									3·925
	Per million souls	6,953	1,000,000	265,784	132,801									27,547·962
	Per £100 of Total Revenue ...	2·64	379	100	52									10·539
	Per £100 of Land Revenue ...	5·07	753	196	100									19·959
	Proportion of the whole ...													1·00

NOTE.—The Parliamentary Return dated 30th July 1857 furnishes the area and population of the Punjab, Oudh, Nagpore, and the Straits Settlements; as also the population of Bengal and the area of Pegu and Mysore. The area and population of Madras and Bombay, the area of Bengal, and the area of the Assigned Districts are taken from the Administration Reports of 1855-56; and the area of the Tenasserim and Martaban Provinces from the Report of 1858-59. The area and population of the N. W. Provinces, the population of the Tenasserim and Martaban Provinces, the Hyderabad Assigned Districts and Mysore are taken from the Reports of 1857-58. Conversion should be made in the population of the Straits Territory, which is 12,036,113 by the Return of 1850-57, and Pegu and Mysore are respectively 800,324 and 1,033,333 by the Returns of 1856-57.

The Land Revenue and Total Revenue are taken from a Return furnished by the Secretary to the Government of India, in the Financial Department for the year 1858-59. The Gross Revenue of Bengal is in the Financial Department Return given at Rs. 13,05,01,113; from this is deducted the Sayer Opium receipts, Rs. 1,37,94,521, and the currency of Opium and Salt advances for Bengal, Rs. 77,05,892. This leaves the Total Revenue as above, Rs. 10,90,00,700. To the Revenue collected in the N. W. Provinces is added the Sayer Opium receipts less currency of advances, Rs. 1,16,16,904, which brings the N. W. Provinces' Revenue up to Rs. 6,62,75,855, as above given. In the case of Pegu and the Tenasserim and Martaban Provinces the Revenue is taken from the Administration Reports of 1859-60, as the Financial Department Returns does not give the Sayer Revenue separate from those of the other Provinces.

APPENDIX C. [P. W. Dept.]

MEMO. BY CAPT. A. FRASER, ENGINEERS.

IN 1856 the flooring and the powder racks in the King's Magazine in Fort William were so far destroyed by white-ants, that it was found necessary to renew entirely the former, and nearly the whole of the latter, at a very great expense.

I was then Garrison Engineer, and on a suggestion of Major Weller, of the Engineers, who had tried the experiment at Loodianah on his own premises on a small scale, I adopted the following plan in renewing the floors, &c., of the building :—

1st. The whole of the old floor was removed, and the plaster of the walls stripped off to a height of 4 feet above the floor line.

2nd. The earth in the interior was dug out about one foot in depth.

3rd. The excavated portion was filled in with concrete containing a proportion as per margin of yellow arsenic called in the bazaar "hurtal."

Two seers (4 lbs.) of the yellow arsenic to the 100 cubic feet of concrete.

4th. Above this floor were raised pillars with proper foundation upon which rested the joists, which were painted; the floors were laid with 3-inch planking but not painted.

In the mortar used for the pillars was also an admixture of the arsenic, in the proportion of ½ lb. to 100 cubic feet of brick masonry, and in the paint a small quantity of the arsenic was in like manner used.

5th. The first 4 feet in height of the Magazine was re-plastered with sand plaster, in which was also contained arsenic in the proportion of 4 chittacks (½ lb.) to 100 superficial feet of plaster.

6th. The whole of the racks were painted with white paint, and the whole of the interior of the Magazine white-washed, both the paint and the white-wash also containing small quantities of the "hurtal."

In 1856 not only the building, but the whole immediate neighbourhood was swarming with white-ants, and in 1859 the Town Major was requested by the Government to make a report as to the effect of the above measures, and annexed is a copy of his reply.

From Lieut. Col. ORFEUR CAVENAGH, *Town Major, to Major* R. STRACHEY, *Officiating Secretary to Government, P. W. D., No.* 1, *dated 6th January* 1859.

SIR,—IN reply to your letter No. 6220 of the 10th ultimo, I have the honour to state that it appears from a report furnished by the Commissary of Ordnance in charge

[*P. W. Dept.*] of the Arsenal, that the flooring and powder racks in the King's Magazine have been carefully examined, and that no traces of white-ants have been found either inside or outside the building.

MEMO. BY CAPTAIN MAN.

IN 1849 I substituted a planked for a tiled flooring in a room on the ground-floor of my house at Singapoor. This was entirely destroyed by white-ants in a few months. I re-laid fresh joists and planking painted over with the gambier composition, and within two or three days the white-ants made their appearance through the crevices between the tiles of the adjoining room, being apparently unable to remain in the vicinage of the protected planking.

I lived in the house for several years afterwards, and the flooring seemed to be in excellent order when I left. I have tried gambier as a preservative against the "teredo navalis" and with equal success, but then I substituted tar or black varnish for dammar oil. I have used it largely on the piles of wooden bridges near the sea and other exposed situations, and after several years' trial, found the timber perfectly free from those destructive animals. I recommended this composition to my successor, Captain McPherson, and he has adopted it with equal success on many occasions.

GAMBIER COMPOSITION.

Dissolve 3 pints of gambier in 12 of dammer oil over a slow fire; then stir in 1 part of lime, sprinkling it over the top to prevent its coagulating and settling in a mass at the bottom; it must be well and quickly stirred. It should then be taken out of the cauldron and ground down like paint on a muller till it is smooth, and afterwards returned to the pot and heated. A little oil should be added to make it tractable, and the composition can then be laid over the material to be treated with a common brush.

Against the teredo I substituted the same proportion of black varnish or tar for dammer oil. I of course omitted the grinding down, which would not answer with tar.

EXTRACT FROM MILBURN'S ORIENTAL COMMERCE, 1813.

"Gutta Gambier is juice extracted from the leaves of a plant of the same name (*Uncaria Gambier*) growing in Sumatra—inspissated by decoction, strained, suffered to cool and harden, and then cut into cakes of different sizes or formed into balls. Chief places of manufacture—Siak, Malacca, and Bintang. It is used by the Malays with the leaves of betel in the same manner as *Cutch* (or *Catechu*) in other parts of India. For this purpose the finest and whitest is selected; the red, being stronger tasted and rank, is exported to Batavia and China for the purposes of tanning and dyeing."

Now exported to England to some small extent.

From Colonel W. SCOTT, *Acting Chief Engineer at the Presidency, to the Right Hon'ble Lord* ELPHINSTONE, G. C. H., *Governor and President in Council, Bombay, No.* 6348, *dated* 24*th December* 1858. [P. W. Dept.]

MY LORD,—In reply to the 2nd para. of the Government Resolution under Mr. Chief Secretary Young's Memorandum No. 3473 of the 14th instant, I have the honour to report that a rule has been in force for some years to eradicate white-ants' nests near public buildings. It has, in some cases, been found very effective, but in others white-ants abound in places where the nest cannot be discovered, and not unfrequently there are several queens in one nest.

2. Major North used to soak his timber at Belgaum in a hot solution of sulphate of copper, and the immediate effect was very satisfactory; but Captain DeLisle, from careful experiments with deal, found that the penetration was scarcely appreciable, the effect therefore cannot be permanent.

3. When timber is boiled in an antiseptic solution under pressure, the result is very satisfactory, but considerable apparatus is requisite, and the system cannot be economically employed except on a large scale.

4. A mixture of sulphate of copper, or of arsenic, with the lime in immediate contact with timber, offers perhaps the most ready method of preserving it from insects, corrosive sublimate combines with lime, and forms an inert substance (yellow wash of medicine).

5. I have circulated the receipt given below, which is said to answer in the Madras Presidency, and requested Executive Officers to apply it where necessary, taking precautions that it is not applied where it may be accessible, or over any extensive surface.

Poison for White Ants.

	lb.	oz.	
Arsenic	2	4	
Aloes	2	4	
Chunam soap	2	13	Common country soap.
Dhobies' mud	2	8	Khar.

Pound the arsenic and aloes, scrape the soap, mix with mud, and boil in a large chatty half full of water until it bubbles; let it cool, and when cold, fill up with cold water, the mixture should be boiled for an hour; it is applied as a wash.

APPEN

General Abstract of Accommodation for European Troops available, under construction, and ordered, in

N. B.—"Regiments," whether Cavalry or Infantry, to be inserted alike. "Companies"

STATIONS.		ACCOMMODATION EXISTING.						ACCOMMODATION PARTLY READY.							
		For		Improvements urgently wanted.		Improvements desirable, but not urgent.		Total proposed.		Now available for use.		To complete the latter.		To complete the whole.	
No.	Names.	Regts. and Decimals.	Companies of Artillery.	Cost, Lakhs.	Time to complete, Months.	Cost, Lakhs.	Time to complete, Months.	Regts. & decimals of Regts.	Companies of Artillery.	Regts. & decimals of Regts.	Companies of Artillery.	Cost, Lakhs.	Time, Months.	Cost, Lakhs.	Time, Months.
1	Madras	5·649	12·42	4·478	24	·958	...	2·138	2·2	1·45	...	...	...	5·114	18
2	Bombay & Sindh	20·218	29·96	...	...	...	...	1·2	...	·2	...	...	...	7·0	18
3	Bengal and Fort William.	12·25	6·0	6·732	18	8·87	36	3·3	...	·8	...	·58	12	3·0	20
4	N. W. Provinces	17·438	21·636	3·311	6	1·24	24	6·5	5·0	5·05	3·3	7·184	18	20·281	30
5	Punjab	13·18	22·0	1·55	12	2·51	24	5·7	9·0	4·2	9·0	6·54	24	16·85	30
6	Oudh	6·5	4·0	...	...	...	...	7·25	7·0	4·0	3·0	5·356	6	39·175	14
7	Nagpoor ...	1·1	3·25	·99	14	3·8	26	·6	...	·6	...	...	...	·25	9
8	Pegu	3·0	6·0	...	...	18·0	36	...	...	...	...	...	...	...	...
9	T, and M. Provs.	1·2	1·3	...	...	·5	24								
10	Straits Settlements	...	1·5	...	...	..	...	...	...	...	...	...	...	...	...
11	Hyderabad ...	2·5	4·4	·9	4	1·25	24	...	...	...	...	...	...	·2	3
	Grand Total...	* 83·035	† 112·46	17·961	24	37·128	36	* 26·688	† 23·2	16·3	15·3	19·659	24	91·87	30

DIX D.

the Territories of British India, showing the cost of completing it in full, and for partial occupation.

of Artillery to include "Troops." Cost to be given in lakhs and decimals—nothing more.

ACCOMMODATION IN PROGRESS OF WHICH NONE IS YET READY TO OCCUPY.								ACCOMMODATION ORDERED BUT NOT BEGUN.				Remarks as to the nature of the accommodation, and whether any now ordered or under construction is intended to replace a portion of existing accommodation which is unsuitable or decayed, having originally been of a very temporary character, &c., &c.
TOTAL PROPOSED.		MAY BE GOT READY QUICKLY.		TO COMPLETE THE LATTER.		TO COMPLETE THE WHOLE.		TOTAL PROPOSED.		FOR COMPLETION.		
Regts. & decimals of Regts.	Companies of Artillery.	Regts. & decimals of Regts.	Companies of Artillery.	Cost, Lakhs.	Time, Months.	Cost, Lakhs.	Time, Months.	Regts. & decimals of Regts.	Companies of Artillery.	Cost, Lakhs.	Time, Months.	
·78	...	·3	...	·16	6	4·062	36					
·5	2·0	...	...	...	...	3·125	20	2·0	3·0	14·35	24	
·8	4·0	·88	3·0	4·353	8	4·753	16	·9	2·66	6·082	24	
...	...	...	...	...	...	...	...	1·58	3·0	16·27	24	
·15	...	·05	...	·08	4	·17	16					
...	·3											
...	...	...	...	...	...	...	...	1·0	2·0	6·106	12	
·5	...	·025	...	·4	2	·8	2	3·0	·6	35·17	36	
* 2·73	† 6·3	1·255	3·0	4·993	8	12·91	36	* 8·48	† 11·26	77·978	36	

TOTAL.	
Regiments.	Artillery, Company.
* 120·93	† 153·22

Abstract of Permanent Accommodation for European Troops available, under construction, and ordered

N. B.—"Regiments," whether Cavalry or Infantry, to be inserted alike. "Companies"

No.	STATIONS. Names.	ACCOMMODATION EXISTING. For: Regts. and Decimals.	For: Companies of Artillery.	Improvements urgently wanted: Cost, Lakhs.	Improvements urgently wanted: Time to complete, Months.	Improvements desirable, but not urgent: Cost, Lakhs.	Improvements desirable, but not urgent: Time to complete, Months.	ACCOMMODATION PARTLY READY. Total proposed: Regts. & decimals of Regts.	Total proposed: Companies of Artillery.	Now available for use: Regts. & decimals of Regts.	Now available for use: Companies of Artillery.	To complete the latter: Cost, Lakhs.	To complete the latter: Time, Months.	To complete the whole: Cost, Lakhs.	To complete the whole: Time, Months.
1	Madras	4·879	12·42	4·265	24	·958	...	2·138	2·2	1·45	...	...	...	5·114	18
2	Bombay and Sindh	7·116	14·64	...	...	...	...	1·2	...	·2	...	...	...	7·0	18
3	Bengal and Fort William.	5·75	3·0	4·15	18	7·62	36								
4	N. W. Provinces...	5·834	9·936	1·1517	6	·632	24	2·0	...	1·1	...	6·67	18	13·16	30
5	Punjab	8·87	19·0	1·55	12	2·51	24	4·5	9·0	3 10	9·0	3·74	24	16 75	30
6	Oudh	...	...	...	...	...	None.	...	...	...	...	...	...	...	...
7	Nagpoor	1·05	3·25	·98	14	3·7	26								
8	Pegu	...	...	...	...	18·0	36	...	...	...	...	...	...	...	...
9	T. and M. Provinces	...	1·0	...	...	·5	24								
10	Straits Settlements	...	1·25	...	..	...	...	...	...	..	...	...	...	...	...
11	Hyderabad	1·0	4·4	·3	4	1 25	24	...	...	...	...	...	...	...	...
	Total permanent ...	*34·499	†68·896	12·396	24	35·17	36	*9·838	†11·2	5·85	9·0	10·41	24	42·024	30
	Add semi-permanent	*13·024	†13·35	3·345	9	1·5	24	*15·45	†12·0	9·05	6·3	8·749	24	48 396	24
	Total permanent and semi-permanent.	*47·523	†82·246	15·741	24	36·67	36	*25·288	†23·2	14·90	15·30	19·159	24	90·42	30
	Add Temporary ...	*35·512	†30·22	2·22	4	·458	12	*1·4	...	1·4	...	·5	3	1·45	9
	Grand Total ...	*88 035	†112·46	17·961	24	37·128	36	*26 688	†23·2	16·30	15·30	19·659	24	91·87	30

in the Territories of British India, showing the cost of completing it in full, and for partial occupation.

of Artillery to include "Troops." Cost to be given in lakhs and decimals—nothing more.

ACCOMMODATION IN PROGRESS OF WHICH NONE IS YET READY TO OCCUPY.								ACCOMMODATION ORDERED BUT NOT BEGUN.				Remarks as to the nature of the accommodation, and whether any now ordered or under construction is intended to replace a portion of existing accommodation which is unsuitable or decayed, having originally been of a very temporary character, &c., &c.
TOTAL PROPOSED.		MAY BE GOT READY QUICKLY.		TO COMPLETE THE LATTER.		TO COMPLETE THE WHOLE.		TOTAL PROPOSED.		FOR COMPLETION.		
Regts. & decimals of Regts.	Companies of Artillery.	Regts. & decimals of Regts.	Companies of Artillery.	Cost, Lakhs.	Time, Months.	Cost, Lakhs.	Time, Months.	Regts. & decimals of Regts.	Companies of Artillery.	Cost, Lakhs.	Time, Months.	
·78	...	·3	...	·16	6	4·062	36					
·20	2·0	...	...	...	...	2·625	20	2·0	3·0	14·35	24	
...	2·0	...	1·0	·21	4	1·31	16	·2	1·66	2·7	24	
...	...	...	...	...	...	...	...	1·48	3·0	15·77	24	
...	...	...	...	None.								
...	·3											
...	...	...	...	...	...	·1	2	2·0	·6	33·57	36	
...	...	...	...	...	...	...	...	...	2·0	1·106	12	
* ·98	† 4·3	·3	1·0	·37	6	8·097	36	* 5·68	† 10·26	67·496	36	
* ·6	† 2·0	·68	2·0	4·018	8	3·318	16	* 1·7	† 1·0	8·382	24	
* 1·58	† 6·3	·98	3·0	4·388	8	11·415	36	* 7·38	† 11·26	75·878	36	
* 1·15	...	·275	...	·605	4	1·495	16	* 1·1	...	2·1	12	
* 2·73	† 6·3	1·255	3·0	4·993	8	12·91	36	* 8·48	† 11·26	77·97	36	

TOTAL.

Regiments.	Artillery, Company.
* 50·997	† 94·656
* 30·774	† 28·35
* 81·771	† 123·0
* 39·162	† 30·22
* 120·93	† 153·22

Abstract of Semi-permanent Accommodation for European Troops available, under construction, and ordered,

N. B.—"Regiments," whether Cavalry or Infantry, to be inserted alike. "Companies"

No.	STATIONS. Names.	ACCOMMODATION EXISTING. For: Regts. and Decimals.	For: Companies of Artillery.	Improvements urgently wanted: Cost, Lakhs.	Improvements urgently wanted: Time to complete, Months.	Improvements desirable, but not urgent: Cost, Lakhs.	Improvements desirable, but not urgent: Time to complete, Months.	ACCOMMODATION PARTLY READY. Total proposed: Regts. & decimals of Regts.	Total proposed: Companies of Artillery.	Now available for use: Regts. & decimals of Regts.	Now available for use: Companies of Artillery.	To complete the latter: Cost, Lakhs.	To complete the latter: Time, Months.	To complete the whole: Cost, Lakhs.	To complete the whole: Time, Months.
1	Madras	·54	...	·213											
2	Bombay and Sindh..	1·9	6·0												
3	Bengal and Fort William.	4·95	2·0	2·582	9	1·25	12	3·3	...	·8	...	·58	·12	3·0	20
4	N. W. Provinces ...	3·134	5·1	·05	1	·25	24	3·7	5·0	3·15	3·3	·014	2	6·121	24
5	Punjab	·3	...	...	...	...	...	1·2	...	1·1	...	2·8	24	·01	2
6	Oudh	1·0	...	...	...	...	...	7·25	7·0	4·0	3·0	5·355	6	39·175	14
7	Nagpoor	...	...	...	...	...	...	None.	...	...	...	...	...	...	...
8	Pegu	...	...	...	...	...	...	None.	...	...	...	...	...	...	...
9	T. and M. Provinces	·2													
10	Straits Settlements	...	·25	...	...	...	...	...	...	...	...	...	.	...	...
11	Hyderabad ...	1·0	...	·5	4										
	Grand Total ...	* 13·024	† 13·35	3·345	9	1·5	24	* 15·45	† 12·0	9·05	6·30	8·749	24	48·396	24

in the Territories of British India, showing the cost of completing it in full, and for partial occupation.

of Artillery to include "Troops." Cost to be given in lakhs and decimals—nothing more.

ACCOMMODATION IN PROGRESS OF WHICH NONE IS YET READY TO OCCUPY.								ACCOMMODATION ORDERED BUT NOT BEGUN.				Remarks as to the nature of the accommodation, and whether any now ordered or under construction is intended to replace a portion of existing accommodation which is unsuitable or decayed, having originally been of a very temporary character, &c., &c.
TOTAL PROPOSED.		MAY BE GOT READY QUICKLY.		TO COMPLETE THE LATTER.		TO COMPLETE THE WHOLE.		TOTAL PROPOSED.		FOR COMPLETION.		
Regts. & decimals of Regts.	Companies of Artillery.	Regts. & decimals of Regts.	Companies of Artillery.	Cost, Lakhs.	Time, Months.	Cost, Lakhs.	Time, Months.	Regts. & decimals of Regts.	Companies of Artillery.	Cost, Lakhs.	Time, Months.	
·6	2·0	·68	2·0	4·018	8	3·318	16	·7	1·0	3·382	24	
...	...	...	...	None.								
...	...	...	...	None.								
...	...	...	...	...	...	...	...	1·0	...	5·0	2	
* ·6	† 2·0	·68	2·0	4·018	8	3·318	16	* 1·7	† 1·0	8·382	24	

TOTAL.

Regiments.	Artillery, Company.
* 30·774	† 28·35

Abstract of Temporary Accommodation for European Troops available, under construction, and ordered,

N. B.—"Regiments," whether Cavalry or Infantry, to be inserted alike. "Companies"

STATIONS.		ACCOMMODATION EXISTING.						ACCOMMODATION PARTLY READY.							
		For		Improvements urgently wanted.		Improvements desirable, but not urgent.		Total proposed.		Now available for use.		To complete the latter.		To complete the whole.	
No.	Names.	Regts. and Decimals.	Companies of Artillery.	Cost, Lakhs.	Time to complete, Months.	Cost, Lakhs.	Time to complete, Months.	Regts. & decimals of Regts.	Companies of Artillery.	Regts. & decimals of Regts.	Companies of Artillery.	Cost, Lakhs.	Time, Months.	Cost, Lakhs.	Time, Months.
1	Madras	·23													
2	Bombay and Sindh	11·202	9·32	...	...	...	...	...	...	...	...	...	...	...	...
3	Bengal and Fort William.	1·55	1·0												
4	N. W. Provinces ...	8·47	6·6	2·11	4	·358	3	·8	...	·8	...	·5	3	1·0	4
5	Punjab	4·01	3·0	...	...	...	...	...	...	...	...	...	...	...	...
6	Oudh	5·5	4·0												
7	Nagpoor	·05	...	·01	2	·10	12	·6	..	·6	...	...	...	·25	9
8	Pegu...	3·0	6·0												
9	T. and M. Provinces	1·0	·3												
10	Straits Settlements	...	...	...	...	...	..,	None.	...	...	...	...	...	...	...
11	Hyderabad ...	·5	...	·1	2	...	...	...	...	..	...	...	...	·2	3
	Grand Total ...	* 35·512	† 30·22	2·22	4	·45	12	* 1·4	...	1·4	...	·5	3	1·459	

in the Territories of British India, showing the cost of completing it in full, and for partial occupation.

of Artillery, to include "Troops." Cost to be given in lakhs and decimals—nothing more.

ACCOMMODATION IN PROGRESS OF WHICH NONE IS YET READY TO OCCUPY.								ACCOMMODATION ORDERED BUT NOT BEGUN.				Remarks as to the nature of the accommodation, and whether any now ordered or under construction is intended to replace a portion of existing accommodation which is unsuitable or decayed, having originally been of a very temporary character, &c., &c.
TOTAL PROPOSED.		MAY BE GOT READY QUICKLY.		TO COMPLETE THE LATTER.		TO COMPLETE THE WHOLE.		TOTAL PROPOSED.		FOR COMPLETION.		
Regts. & decimals of Regts.	Companies of Artillery.	Regts. & decimals of Regts.	Companies of Artillery.	Cost, Lakhs.	Time, Months.	Cost, Lakhs.	Time, Months.	Regts. & decimals of Regts.	Companies of Artillery.	Cost, Lakhs.	Time, Months.	
·3	...	...	...	...	...	·5	12					
·2	...	·2	...	·125	1½	·125	1½					
...	...	...	...	...	...	...	...	·1	...	·5	12	
·15	...	·05	...	·08	4	·17	16					
...	...	...	...	...	None.							
·5	...	·025	...	·4	2	·7	2	1·0	...	1·6	12	

TOTAL.

Regiments.	Artillery, Company.
* 39·162	† 30·22

* 1·15	...	·275	...	·605	4	1·495	16	* 1·1	...	2·1	12	

[*P. W. Dept.*]

APPENDIX E.

Note by COLONEL R. BAIRD SMITH, C. B., *on Irrigation Revenue, N. W. P., in* 1858-59, *dated* 10*th December* 1859.

THE Officiating Secretary has been good enough to send the Returns of this Revenue for 1858-59 to me, and to ask me to make any explanatory remarks on them that seemed likely to interest Government. I do so with much pleasure.

In judging of the condition and prospects of this Department, it is very essential to take each Canal separately; for the local conditions and objects of each are so separate, that erroneous impressions will result from aggregating them, or by comparing their results with results obtained from works directed to the same main object in other Presidencies. In some instances, as for example in the Deyrah Dhoon, direct Canal Revenue is utterly unimportant, as the first object of Government there is to make population and cultivation possible, which, without the Canals, they are not, since the sole provision of water for man and beast in that part of the country is made by the Canals. The depth at which water exists in the soil is so excessive that sinking wells generally is quite out of the question; and till these little Canals were made, large tracts of fertile land, now filling gradually with a thriving population, were covered with wild grass and jungle. To pronounce these works financial failures, because the mere Canal Revenue Returns showed only a small percentage of profit, would be a great mistake.

Again in Rohilkund, the Government Canals there form but a tithe of the work superintended by the Canal Department. The Superintendent has, or rather had, until the mutiny upset all existing arrangements, the administrative charge of three considerable pergunnahs in Moradabad and Bareilly. He was the general manager and arbitrator for private rights in scores of water-courses, the property of individuals; and while in account the Government Canals bear all the expenses of his Establishment, the larger portion of his work makes no show on paper, but was only to be traced in the steadily increasing prosperity of the general body of the cultivators, in the absence of old water-feuds, and the far superior economy of the water supplies of the districts with which he was connected; there too mere financial Returns would be very unsafe guides.

Nothing could possibly be more different than the Irrigation Establishments in Madras and the N. W. P. Having seen both, I feel pretty sure that the latter, on their present scale, are reasonably well proportioned to the work required from them, and that any attempt on the part of the Government of India to constrain the Government, N. W. P., to adopt estimates derived from experience in Madras as guides, or to bring down fully working Canals to the standard of the yet immature Ganges Canal, would be very inexpedient. I would recommend, therefore, that remarks of the Government of India should be made on the condition and prospects of each Canal or set of District Canals separately.

GANGES CANAL. [*P. W. Dept.*]

The growth of the revenue on this Canal is steadily realizing the prospect of progressive improvement which I have always looked on as a matter of certainty. No one familiar with the lessons of past experience in the development of irrigation in the N. W. P. could possibly have indulged in those dreams of instantaneous results which some have expected and been disappointed because they did not find them. People ignorant of the notable differences between Madras and the North-West think that, because we are told of very high and very rapid returns in the former, less or slower in the latter are fair sources of disappointment. The systems of estimating those returns and of imposing and collecting water rates in the two Provinces are, however, so different, that great caution is necessary in comparing them. I have made such a comparison with the best materials I could obtain, and the general conclusion I have come to is, that the ultimate profits of irrigation are in fact not very different in either. I have certainly known isolated instances of returns from particular works in the North-West which equalled even the highest returns in Madras; but these were purely exceptional, and their effect was lost in the general average.

Looking on the Ganges Canal, therefore, by the light of past experience, I have no hesitation in saying that I think its progress is healthy and natural. Comparing the Ganges Canal with the large Jumna Canals, and taking the first year's revenue of each as unity, the following figures show their relative progress:—

	Ganges Canal.	Western Jumna Canal.	Eastern Jumna Canal.	
1st ...	1·00	1·00	1·00	
2nd ...	2·60*	0·98	1·44	
3rd ...	1·82 Mutiny year.	1·67	3·34	
4th ...	3·62	1·20	6·45	1833-34. Partial famine.
5th ...	"	2·02	5·23	
6th ...	"	1·57	5·32	
7th ...	"	1·97	6·21	
8th ...	"	2·92	12·08	1837-38. The famine year.
9th ...	"	3·08		
10th ...	"	3·21		
11th ...	"	3·01		
12th ...	"	3·20		
13th ...	"	6·61	1833-34. Partial famine.	
14th ...	"	5·42		
15th ...	"	5·41		
16th ...	"	7·12		
17th year. ...		11·19	1837-38. The great famine year.	

A glance at these figures will show decisively that so far nothing could be more encouraging than the actual condition of the Ganges Canal. Its progress, but for disturbing influences, would probably have corresponded closely with that of the Eastern Jumna Canal, while it has been much more rapid than that of the Western Jumna Canal. In comparing it with the former, the repressive effect of the mutiny on the one hand, and the

* See correction paras. 6 and 7 Colonel Yule's letter page 29.

[*P. W. Dept.*] stimulating influence of the partial famine of 1833-34 on the other, must be allowed for; but that being done, the ratio of annual improvement is tolerably close. Comparing its growth with that of the Western Jumna Canal, it will be noted how very slowly the revenue of the latter advanced. It took nine years to triple the 1st year's revenue, while on the Ganges Canal this result was attained in four years.

The influence of partial or total famines, due to failures of the usual rains, is very strikingly shown in these figures, and is worthy of notice. In 1833-34 the failure of the rains was not universal throughout the districts watered by the Canals, but its effect was at once to double the highest previous revenue. In 1837-38 the monsoon failed universally, and the revenue, as influenced by the previous partial famine, again doubled nearly, and it was not until these, if not unnatural, certainly very undesirable stimulants, were applied to the revenue, that the Jumna Canals were able to meet their ordinary annual expenditure for establishments and repairs.

They would doubtless have grown in time up to the standards they have now reached when the revenue of the Western Jumna Canal is equal to about 13 times, and that of the Eastern Jumna Canal to about 20 times, their first year's returns. But that time would probably have been three times as great as it has been in fact, and I must say that, in the case of the Ganges Canal I look for no sudden bounds of the revenue upwards, unless under the stimulus of a failure of the rains, more or less complete. But I look for a steady regular growth, of which the past four years are at once the index and guarantee. Should the ratio of increase they warrant us to hope for be realized, the Ganges Canal will, in two or three years more, pay all its current expenses, and begin to be profitable.*

I have dwelt somewhat elaborately on this question of growth, because I know nothing more likely to damage greatly the truest interests of the Government and the people in this great work than that the Government of India should lead the Officers responsible for the progress of the Canal to think that an unfavourable opinion is entertained of them and their exertions because growth is not quicker. I am satisfied the work could not be in safer or better hands; but if such impressions as the above might not influence the superior Officers, it is absolutely certain that they would have a potent effect on the Native Establishment, and would lead, as in truth they already have led, to various wretched expedients, whereby it was supposed a better revenue might be forced. All such forcing is both wrong and quite useless; it is certain to fail in its object, and will upset all the provisions that have been made against deceit and extortion. I am, therefore, most anxious that the hands of the Superintendent General should be strengthened, so far as may be, in his efforts to repress the motives in which it has origin.*

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* Since the above was written I am informed that the Ganges Canal revenue for 1859-60 is likely to range between three and four lakhs. The present [average] annual expenditure is a little over the smaller of these sums. Should this expectation be realized, therefore, the time at which the Canal will pay its expenses will be materially accelerated. At the same time as this rapid increase is unquestionably due to the deficiency of the usual rain-fall, a falling off must be looked for should next season be a regular one.

There is one other point to which I wish to draw attention in connection with the progress of the Ganges Canal. It will not be supposed that I am either ignorant of, or indifferent to, present financial difficulties, or that I claim for the Ganges Canal any special exemption from the restrictions these have made necessary. But it is still right to notice that the suspension of all progress has taken place at a time peculiarly unfavourable for the Canal. The larger amount, by far, of the expenditure incurred has been on the comparatively unproductive parts of the Canal. Fully half has been spent on the first 20 miles in bringing the water across the drainage of the Sub-Himmalayas and delivering it on the high land of the Doab. About two-thirds have been spent on the first 50 miles, and while returns are derived only from the works as they stand at present, it is impossible that such returns can be high. The high returns are to be looked for from the great branches which, cheap of execution from having no drainage of importance to cross, traverse rich tracts of fertile districts at admirable levels, and will assuredly give profits much above the average of the main trunk. All these branches are at present necessarily stopped, but till they are completed, there will be no full development of the capabilities of the Ganges Canal. About twenty-five lakhs will be necessary to finish them all, and so soon as the revenue can bear a drain of say eight lakhs a year, it would be true economy to devote that sum for three years to the completion of the Futtehghur, Boolundshuhur, Coel, and Hattras Branches. So long as they are unopened, it is physically impossible to admit the full supply into the Canal, and while the supply is kept thus low, irrigation is carried on in the most disadvantageous manner possible, and at a considerable increase of expense to the cultivators, from their having to raise the water artificially to the levels of their fields. [*P. W. Dept.*]

The progress of the navigation on the Ganges Canal is very satisfactory. It has risen from about Rs. 18,000 in 1856-57 to Rs. 46,000 in 1858-59, or about 250 per cent. It will by and bye be exposed to competition with the East Indian Railway; but there is produce enough flowing down, I suspect, to give employment to both. The difficulty created by the current is an irremediable one, except at an enormous expense in constructing new Falls, and thus reducing the slope of the bed. Such reduction would entail, of necessity, an increase in the section of the Channel, to effect which with a running Canal would, of course, be impossible; so that the evil must be accepted as part of the project. I do not expect the silt deposits to cease for a very long time. There is much erosion both of bed and banks generally along the Canal, and particularly in the sandy tracts, and this is not likely to be stopped. So long as it continues, deposits will occur wherever the current is checked. The annual repairs are also indispensable, and on the whole, the conclusion is in accordance with all previous experience, viz., that Canals of Irrigation are, almost necessarily, *imperfect* Canals of navigation.

The other sources of revenue do not require any special remarks.

Eastern Jumna Canal.

This Canal is now beginning to show fully the advantages of the great improvements made in its works of late years. The line was straightened and its bed levels regulated on

[*P. W. Dept.*] about 30 miles in length, and the economy of water has been great. The maximum revenue from the Canal I used to estimate at two lakhs per annum. It is coming very close to this now, and will probably reach it in a year or two.* If efficient administration will secure this, there is little reason to doubt, as Major Brownlow is one of the best Officers in the Department.

The expenses on this Canal will always be rather high, as it is carried over some very difficult ground in its northern section, and is liable to serious accidents from floods. The actual returns at this time, however, are certainly not less than about 15 per cent. on the capital; this estimate including both direct and indirect revenue.

WESTERN JUMNA CANALS.

The condition of the revenue of the Western Jumna Canals must be viewed at present with very mixed feelings. It is satisfactory to see it range so high, as showing that, whatever may be the results in some sections of the works, they must on the whole be contributing largely to the wealth and progress of the community. It is quite impossible, however, to forget that, while in the good portions of the Canals about three and a quarter lakhs of water revenue are being realized, we have the evidence of the Civil Commissioner, who was specially employed in examining the question, that in the bad parts about three and a half lakhs of land revenue are in jeopardy from the steady progress of deterioration in some of the finest estates bordering on the Canal.

It is greatly to be desired that on those bad portions either drainage works, or readjustment of the bed levels should be made, so as to relieve the land from its present state of saturation, and the people from the deplorable consequences of this state of things on their health and property. Each year's experience on the Eastern Jumna Canal supplies cumulative evidence of the sound economy of expenditure in securing good bed levels; and seeing how well the plan has acted there, its application on the Western Jumna Canal is now recommended both by practical experience and safe argument. It is possible that something may be in progress to this end, but I have not heard of it; and the subject is too intimately connected with the question of the influence of the Canals for good or evil, to be passed over in a review of their actual condition.†

The cause of the evils complained of on the Western Jumna Canal is one which is likely, I fear, to tell heavily on even the newest and best designed of our irrigation schemes. It has begun to show its effects on the Ganges Canal, and the physical features of the country warrant the expectation that it will be seen in time on the Baree Doab Canal. Wherever, indeed, we invert the law of nature, that places rivers generally in

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* The same general cause, viz., deficiency of rain, which has acted on the Revenue of the Ganges Canal, has acted equally on that of the Eastern Jumna Canal. It is expected that the returns from the latter for 1859-60 will rise to about Rs. 2,80,000.

† A project is in a state of forwardness, and attention was drawn to it in the Governor General's orders on the Punjab Budget for 1860-61.—*P. W. Office Note.*

valleys, and establish them (as our Canals, which are in fact artificial rivers, are established) on the highest ridges, we must expect that when such ridges are connected by porous strata with low lying lands, the action of the elementary hydraulic law, which carries water to the level of its source of supply, will inevitably lead to these lands being first saturated, and in time submerged, unless an outlet is supplied for the percolating water. We could prevent such saturation and submergence only by making the Canal channels entirely water-tight; but with works of such magnitude as the Ganges and Baree Doab Canals, this is practically out of the question. [*P. W. Dept.*]

This is not the place or time, however, to deal with the technical bearings of this very important question, but its influence on the Irrigation Revenue, both of the N. W. P. and of the Punjab, and, I may add, of other Provinces into which Canals on a large scale and at high levels may yet be introduced, is so vital, that some reference to it seems necessary.

Dhoon Canals.

As I have already explained, the money returns from these are of comparatively little consequence. The Rajpoor Canal supplies drinking water without charge to the whole town and station of Deyrah, and the Bejapoor Canal has brought a tract of about 7,000 acres into profitable use, which was nearly deserted before. Both have paid all their expenses and returned a small clear profit from the water rates, but their indirect advantages have been far higher.

The Kutta Pathur Canal has not hitherto been a success, less from any fault of the Canal than from the fact that the grantees of the land to be irrigated from it have not been in circumstances to make full use of it. The original grantees failed, and the estate has passed from owner to owner for years past without any material extension of cultivation. So the Canal water runs to waste. As Tea planting is now extending in the Dhoon, and the land is well suited for it, I think it very likely this Canal will yet pay.

The only way to redeem the Dhoon to human uses is to give water judiciously in certain localities, and to withdraw it judiciously from others; the process will pay well even though the Canal Officers may not be able to show the results in their Annual Returns.

The Kalunga and Jakhun Canals are new works of the same type as the Rajpoor and Beejapoor Canals; little streamlets that you can step across, but without which village communities cannot grow up at all. They will not pay highly, but they will redeem two new tracts of the Dhoon, at present very sparsely occupied.

[*P. W. Dept.*]

ROHILKUND CANALS.

These also are very small and scattered works, the largest of them scarcely bigger than a Ganges or Jumna Canal "Rajbuha," or main water-course. They have rallied remarkably well, considering how completely the districts they water were in possession of the rebels. I believe the Superintendent has no longer the supervision of the three Terai Pergunnahs, formerly part of his work, but I hope his relation to the private proprietors of water-courses, as the general referee and arbitrator, may continue to be maintained. It is quite impossible that disputes about water can be intelligently settled, excepting by an Officer familiar with practical Hydraulics, and a commodity so precious gives rise to so many disputes that a special provision for disposing of them has worked well.

I believe the pay of the Superintendent is now sensibly less than it used to be, so that the annual expenses will be less in proportion.

AGRA WORKS.

These are scarcely developed as yet, and consist mainly of arrangements whereby irrigation by saturation is made practicable. The water is thrown broadcast over the face of the country, and allowed to drain off by natural channels. The system is the worst of all forms of irrigation, and in the Agra District has been occasionally accompanied by severe outbreaks of malarious fever, of which there can be little reasonable doubt it was an aggravation if not a first cause. Projects for converting this irregular sort of irrigation into a more controllable and systematic process had been sanctioned prior to the mutiny, and will doubtless be completed in time. The scale of the works is as yet so small that it is scarcely worth while making any special note of them.

The general effect of the mutiny has clearly been to produce a sensible diminution of the revenue of the Irrigation Department, but I question whether there was any diminution of the quantity of water used. On the Ganges Canal we know that villages all along its length used the water in the most reckless fashion, by cutting the banks and letting it flow over their lands. The only serious damage done to the works in the Etawah Division was traceable to the determination of the Zemindars to get the water, as they blocked up the arches of a large bridge, and raised the water so high that the whole work was destroyed. There were, however, no Government Officers, European or Native, to take notice of the irrigated land, and the people got the water pretty generally without having to pay for it. I suspect that if all land watered with Canal water during the troubled months of 1857-58 had borne the usual charge for it, the surplus water rent, as compared with the corresponding period of the previous year, would have been very much over about Rs. 2,700. It is certain, however, that villages which once take Canal water rarely give it up again; so the illegitimate consumption of 1857-58 had no doubt a material effect in producing the large increase in 1858-59.

I have only to add that the statistics it has been proposed to call for cannot be supplied by the Offices of the Irrigation Department in so far as increase of land revenue due to the Canals and like details are concerned. These can only be got from the Land Revenue Officers, and as the settlement now in progress is completed will be given in due course as part of the Settlement Reports. Details of crops watered can be given on Canals where measurement rates prevail, but not where contracts are given. I doubt, however, if much practical good would come of having them, and preparing them would entail much labour on small Offices. It had always been my intention to centralize the Revenue Accounts of the Department as those for works have been centralized, with a view of relieving the Executive Offices, and I dare say this will be done in time. I am at present, however, always reluctant to ask a single Return from Executive Offices that can possibly be done without, as such extra demands hamper them much. [*P. W. Dept.*]

On the whole I think the Government of India may very safely express its general satisfaction with the results attained in the Irrigation Department, North-Western Provinces, during the year 1858-59.

[*P. W. Dept.*]

APPENDIX F.

From R. H. DAVIES, ESQ., *Secy. to Govt. of Punjab, to Secy. to Govt. of India, P. W. Dept.,—No.* 192—891, *dated 26th April* 1859.

I AM directed, with reference to your letter No. 2219, dated 6th April, to submit the information called for by the Right Hon'ble the Secretary of State in a letter to the address of the late Chief Commissioner, dated 3rd January last, regarding the feasibility of Mr. Bourne's project for the construction of a canal through the Sindh Saugor Doab.

2. The Officers whose opinions Sir John Lawrence solicited were the Judicial Commissioner, Mr. Thornton; the Financial Commissioner, Mr. McLeod; the Director of Canals, Captain Dyas; and the late Superintendent of Inundation Canals, Captain Medley; copies of their Reports* are herewith submitted.

* Judicial Commissioner, No. 92, dated 16th February.
Financial " " 228, " 20th April.
Director of Canals, " 1896, " 5th March.
Captain Medley, " 110, " 7th February.

3. In the opinions expressed there is a general agreement. All are unanimous that the construction of a canal by a Public Company is in the highest degree desirable and important, and would, there is every reason to believe, be amply remunerative. But the particular kind of canal contemplated by Mr. Bourne is not approved. His project consists of an inundation canal which will admit water from the Indus through a channel half a mile broad and six feet deep; and this canal is to be filled only when the water is above a certain level. Such a design does not promise well. There may be, it is anticipated, Engineering difficulties. At all events, the absence of water fit to drink in that tract of country would necessitate a permanent canal, if a colony were settled for agricultural purposes. And in addition, the profits of the Company would be seriously lessened by water not being afforded to the spring crops which are the most valuable, but which could not be irrigated by an inundation canal. Whilst therefore the Hon'ble the Lieutenant Governor could not recommend the adoption of such a project, His Honour would view with satisfaction the construction of a permanent navigable canal.

4. The land of the Sindh Saugor Doab is only in rare and exceptional instances held at present in proprietary right. Herds of camels and cattle wander over it, and in some places the grazing is valuable. Here and there small villages have been established, and wells sunk, and it is the rights of such occupants only that it would be necessary to reserve, were those of Government transferred wholly or in part to a Company.

5. It will probably be necessary to decide on what terms the land is to be granted before any definite arrangement can be made. The Company apply for the land free of all payment of revenue for ever, on condition of making the canal. It is questionable, however, if so large a concession be necessary. The rent paid for water alone would probably give a considerable profit on the outlay, as is the case with canals constructed at the cost of Government. Mr. Thornton's suggestion is therefore worthy of consideration, that the land should be granted free of revenue only for a time, and that it shall gradually be subject to the imposition of a low and limited tax.

6. The Lieutenant Governor is himself of opinion that any Company undertaking a work so beneficial should be liberally dealt with. But at present he doubts the sufficiency of the information possessed by Mr. Bourne. His Honour would suggest that some members of the Company should be deputed to visit and survey the locality, and aid their judgment by personal examination. Every facility will be afforded by this Government and the Officers subordinate to it for the acquisition of full and trustworthy data for the scheme. [*P. W. Dept.*]

7. That part of the plan which contemplates the location of a colony of European labourers is entirely chimerical. Disease brought on by manual labour in the sun would certainly prevent the success of this arrangement. But although the native population is now thin and nomad, the construction of a canal would speedily attract to the pursuit of agriculture the inhabitants of the hills and surrounding districts.

8. The apprehension entertained, that the withdrawal of the water of the Indus for a canal would injure it as a navigable river, would also appear to be unfounded. And if the canal itself were made navigable, it would in all probability supersede the river as the highway of commerce.

9. Captain Anderson of the Madras Engineers, who had formerly the superintendence of the Inundation Canals of the Punjab, and has great knowledge of their circumstances and requirements, is now in England, as well as Colonel Browne, the Commissioner of the Sind Saugor Doab, and the Lieutenant Governor would suggest that Mr. Bourne be recommended to consult these gentlemen regarding his scheme.

From EDWARD THORNTON, ESQ., *Judicial Commr., to Secy. to Govt. of Punjab,—No.* 92—760, *dated* 16*th February* 1859.

I HAVE the honour to reply to your letter No. 293 of the 3rd instant, respecting a scheme for reclaiming the desert tracts of the Sindh Saugor Doab by means of European Agriculturists, aided by an inundation canal.

2. The project relates to that portion of the Doab which lies below the Salt Range, whereas my local knowledge in the Doab extends only to those mountains and the country north of them. I am, however, acquainted with the adjoining tract lying between the Indus and Chenab, and believe there is a strong similarity between them. The former, like its neighbour, is but little cultivated; a portion of the waste lands, as well as all the area under tillage, is the acknowledged property of a resident population, while a large amount of the waste is without other owner than the State.

3. Moreover, they both correspond with the other Doabs, those enclosed by the Chenab and Ravee, and by the Ravee and Sutlej, in this remarkable feature, that though they are almost uncultivated, save at the river margins, their central wastes are not uninhabited. The population is sparse, but nevertheless it exists, and is diffused over the whole area. The people are debarred from agriculture by insufficiency of rain and by the

[*P. W. Dept.*] general brackishness of well water. But where, here and there, a well has proved wholesome enough to sustain animal life, villages have been formed and pastoral occupations are carried on.

4. The second peculiarity is, that the soil, though not excellent, is fitted for agriculture.

5. Such being the circumstances it is most mournful, to any person interested in the prosperity of the country, to see year succeed year without adoption of the measure which nature has provided for the improvement of these tracts. Let but a canal be carried over each Doab from the adjoining river, and the desert is converted into a fertile country. The sparse population would in a few years supply the requisite hands, so rapidly would it multiply under circumstances so specially favourable.

6. In ten years only one of these Doabs has been promised the advantage of a canal, and so heavy are the demands on the public purse, that I believe even that one work, the Baree Doab Canal, is not at present to be developed to its fullest extent.

7. When therefore an application like the one now under consideration is made, a proposal to construct a canal in one of the largest Doabs, by means of private enterprise, I am strongly inclined to think it should receive all possible support.

8. Those lands which are the property of Government might be given to a Company on the condition of its establishing a canal, and should be given subject to a land tax. The tax should be imposed gradually, should not be taken for land that has not been several years under tillage, and should not exceed a moderate rate, say twelve annas per acre. A maximum water rate, demandable by the Company from other proprietors of land for water used in irrigation should be laid down, as also a maximum rate per ton for water carriage.

9. I do not think the canal should be an inundation one, as proposed by Mr. Bourne the present applicant. A permanent canal would be much more useful, and considering the impetuous character of the Indus above Kalabagh, such a canal would do much more good than would counter-balance any injury it could produce to the navigation of the river.

10. I consider that Europeans could not cultivate the lands with their own hands. European ploughmen would fall victims to the sun, and even could they withstand its effects they would be too expensive. But European farmers would be of great benefit by their science in agriculture, their knowledge of the requirements of foreign markets, and their general intelligence.

From D. F. McLEOD, ESQ., *Financial Comr., to Secy. to Govt. of Punjab,—No.* 228, *dated* 20*th April* 1859.

I HAVE the honour to acknowledge the receipt of your letter No. 292, dated 3rd February last, with enclosure, on the subject of a proposition submitted by J. Bourne,

Esq., to the Right Hon'ble the Secretary of State for India, on behalf of a Company, [*P. W. Dept.*] for reclaiming the desert portions of the Sindh Saugor Doab by irrigating them from the River Indus, and in reply to state that the scheme, as proposed by Mr. Bourne, is, in my opinion, not feasible, but that a modified one, having in the main the same object in view, might be substituted, which, if taken up earnestly by British Capitalists, might, I think, be expected to prove highly advantageous to this country, as well as remunerative to the projectors.

2. From the mode in which Mr. Bourne has discussed the matter, I gather that he does not even profess to have made such detailed enquiries as would be indispensable before any conclusive judgment can be formed on such an undertaking. But the first main objection which I would urge to his proposition is that a canal, such as he advocates, has been shown by experience to be most unsatisfactory, insomuch, that, although the inhabitants of the country gladly avail themselves of such canals, as they enable them partially and more or less continuously to cultivate lands, which, without irrigation in some shape, must remain entirely waste, yet I do not think it possible they could ever meet the requirements of European Capitalists.

3. These canals are here known by the name of "Inundation Canals," and are largely employed in the tracts adjoining the lower portions of the Sutlej, Ravee, Chenab, and Indus. The quantity of water which they will supply in any year, and the period for which they will supply it, depend entirely on the rise and fall of these rivers which are so fluctuating and uncertain, that the prospects of the cultivators who are dependent upon them, are liable at all times to the most grievous disappointment to such an extent, that the question, how to assess the Government revenue on lands irrigated by these canals, is one of the most difficult problems which this Government has yet to solve.

4. These canals, at least such of them as occur in the lower portion of the Baree Doab, were for some years superintended by an Officer of great ability, Captain Anderson, of the Bombay Engineers, and so strongly was he impressed with the conviction of their very unsatisfactory character, that he recommended the construction of a sluice dam, costing nearly a million of money, across the Sutlej, with a view to superseding the greater portion of them by a permanent canal, while Captain Fife made a nearly similar proposition for the lower part of the Indus in Sindh. The Barrage constructed across the Nile seems similarly to show that as nations advance in intelligence, they cease to be satisfied with the uncertain advantages derived from periodical inundation.

5. In addition to their uncertainty, it is a very serious drawback to the utility of such canals, that they are incapable of irrigating the spring crops, which are usually much the most valuable, though they may suffice to soften the land previous to the sowing season, so as to admit of the seed being sown; and if the rise of the river occur at an early period, they may sometimes afford one flooding before the crop is quite ripe. They are at least but a very poor substitute for a permanent canal, and as I have said I do not think they could ever be adopted, with satisfaction, by European Capitalists.

[*P. W. Dept.*] 6. Whether a permanent canal would be practicable in the locality indicated, is a point on which I am not competent to judge, but I believe that it would, and that from the character of the river above Kalabagh a permanent head might be readily obtained, so circumstanced as to admit of a constant supply being thrown into it, as is done from the Ravee into the Baree Doab Canal Head, by mere temporary and comparatively inexpensive structures, without the necessity for constructing a massive and expensive anicut or dam, as suggested by Mr. Bourne. Should this be the fact, there can be no room for doubt that such a canal must prove a great blessing to the country, and I should think it highly probable that it would prove most remunerative, as such canals have proved everywhere else in India.

7. Another serious objection to the scheme so broached by Mr. Bourne I consider to be that it includes the location of European cultivators, an object the attainment of which no one acquainted with the plains of India need be told is entirely chimerical. Englishmen engaged in agricultural pursuits no doubt enjoy excellent health in some parts of India, but it is as Overseers only, not as labourers. For manual labour out of doors, the climate of such a locality as the Sindh Saugor Doab, must utterly disqualify them; and even if it were otherwise, they could never hope to compete in this calling with the natives of the country, to whom two pence a day is handsome remuneration. The employment of Europeans in such a manner is moreover as unnecessary as impracticable.

8. I have never myself gone further than the mere edge of the "Thull" or Sandy Desert, which constitutes the greater part of the Sindh Saugor Doab below the Salt Range. But I believe Mr. Bourne to be mistaken in supposing that it is a level plain, capable of being wholly irrigated. It is almost throughout more or less undulating, the sand hills or drifts being frequently of considerable elevation, so that irrigation could only reach the portions between these, and I should think it probable that not more than one-third or one-fourth of the entire area at the utmost could be irrigated, even if a sufficiency of water were available for the whole.

9. As it is the inundations of the Indus occasionally reach a considerable way into the Thull in some parts, the streams on these occasions meandering amongst the sand hills, and producing great fertility; and wherever this is the case, cultivated spots of great richness will be found, Indigo being one of the principal crops. This is not mentioned by Mr. Bourne, but there can, I think, be no doubt that if this desert were reclaimed by European capital and energy, Indigo would prove the most important article of produce. The mode of manufacture at present employed is of the most wretched description, yet the dye is largely exported, and the cultivation of the plant, which is already considered by far the most remunerative of all crops, is steadily increasing. Flax may, I believe, be also produced in that tract if water be available, but as it is entirely a spring crop, a permanent canal would be quite indispensable. For cotton, which Mr. Bourne also mentions, I do not believe that locality to be in any way adapted.

10. As regards the proprietorship of the soil, no attempt has as yet been made, nor indeed would it be practicable to define the boundaries of villages. Of these there

are, I apprehend, but very few of a permanent character, the population consisting chiefly, and in some parts exclusively, of nomad races of camel breeders and cattle graziers. The grazing is very fine in parts, especially is one long continuous tract, which I understand extends longitudinally down a considerable portion of the Doab looking like an old bed of the river, and it may be presumed that these tribes would be but ill pleased at their grazing grounds being invaded; but many of them are residents of other parts, resorting hither only at particular seasons, and there can be no claims to proprietorship, such as would preclude Government from conferring on applicants the grant of as much land as could possibly be required, though it is not improbable such tracts would here and there be interspersed with cultivated spots, or permanent locations, in which it would be necessary to resume the proprietary rights of the occupants. [*P. W. Dept.*]

11. Apart from the question of irrigation, there can be no doubt that the value of a permanent (not an inundation) canal as a means of navigation would be immense, for although boats readily descend the Indus from Kalabagh downwards, the ascent of that stream is, for the most part, an undertaking of very great difficulty; whether the formation of such a canal would not render the Indus less navigable than at present I am not able to judge. But if the canal itself were made navigable, as it no doubt would be, it would most beneficially supersede the river as a means of transport, so that any injury to the river channel that might result would hardly be a matter for regret.

12. It might perhaps be wished that Mr. Bourne had discussed the matter in a spirit evincing more of pains-taking enquiry and accuracy. But I believe that those who directed his attention to this project must have had better grounds for their recommendation than appear in his paper, and for the reasons which I have given in the foregoing remarks, I anticipate that if European Capitalists can be induced to enter upon the project with energy and intelligence, very important results are likely to ensue.

From CAPT. J. H. DYAS, *Engrs., Director of Canals, to Secy. to Govt. of Punjab,— No. 1896, dated 5th March* 1859.

IN reply to your letter No. 294 of the 3rd ultimo, calling for my opinion as to the feasibility and the expediency of carrying out a proposal by Mr. J. Bourne (dated 29th November last), for the construction of an Inundation Canal from the River Indus in the neighbourhood of Kalabagh for the purpose of irrigating the Sindh Saugor Doab, I have the honour to state that I do not think Mr. Bourne's scheme (as explained in the proposal annexed to his letter of the above date to the Secretary of State for India) is either feasible or expedient.

2. In a slightly different form, that is, if he would propose to construct a permanent Canal adapted for steam navigation, instead of an Inundation Canal, which runs for only half the year, and if he would propose to people the Doab with the inhabitants of adjacent and surrounding countries, instead of with Europeans, the thing might answer well enough.

[*P. W. Dept.*] 3. I regret that the Sindh Saugor Doab, lying beyond the limits of my work, is almost *terra incognita* to me. I have, it is true, crossed the "Thull" as the sandy desert is there called, by three different routes, viz., from Leia to Moozufferghur, from Moozufferghur to Dehra Ghazee Khan, and from Jainpoor to Dhoondoo, but all three lie so close to the tail of the "Thull" that I could gain but little knowledge of the nature of the interior of the country.

4. From what I saw, however, I should describe the "Thull" to be a desert of drift sand with occasional "oasis" of very limited extent. The sand lies in huge wreaths and hillocks, the latter often reaching the height of 40 to 50 feet above the general level of the country, which is for the most part destitute of vegetation if we except a low shrub growing with knots or joints on its leafless twigs, and called by the natives "pogh" (or like the o in pole). I have never seen that shrub anywhere else, sometimes a few "jhund" and "bur" (peeloo) bushes are met with. The roads, except when they run through an "oasis," have to be marked out with "blazed" sticks, lest the traveller should miss the tracks altogether in the drift sand, for there are no land marks to be seen. If he ascends to the top of the highest sand hill within reach, he sees nothing but an interminable waste of similar hillocks.

5. The "oasis" are small patches of ground free from sand, and they look like little valleys surrounded by low hills. From this it may be conjectured that the drift sand merely overlies the firmer soil below. This soil is, however, almost every where, as far as I could ascertain, strongly impregnated with "kullur" (impure nitrate of soda) to such an extent that considerable practice is requisite before one can drink the water there found. For in some of these "oasis" when they lie not very far from the river, or from a water-course from one of the Inundation Canals, are wells, and for the rest the soil is so retentive that even in the middle of March I found stagnant water in pools and excavations. In places the water produces such an instantaneous effect on the bowels that the natives say it runs through man or beast like quicksilver! It certainly is very nauseous. A few of the "oasis" are irrigated by water-courses from the canals (this of course only low down in the Doab), and it is wonderful how the slender stream holds its own against the sand hills, round the base of which it winds often for considerable distances.

6. The upper portion of the Doab I have never seen, but I have heard that so high up as Kalabagh there is no sand even in the interior of the country. There must be many men however who have been there, and who can speak with certainty on this point.

7. I don't altogether agree with Mr. Bourne's view of improving the navigation of the Indus by taking water out of it, even in the season of floods. I think the courses of the Punjab Rivers shift, not so much because their volume in floods is too great, but because their banks are composed of more friable material than even the silt which is annually swept down by their floods. The slope and the consequent velocity of these rivers is very great during the early part of their course, and until they emerge from the hills. Thence it rapidly diminishes, and the current becomes unable to pass on the heavier

silt so rapidly as it arrives from the higher parts of the river. The silt is therefore de- [*P. W. Dept.*]
posited on the river's bed, which is thus, as it were, protected from attrition by a covering stronger than itself. The level of the water is by the same process raised, and the stream being unable to deepen its channel, is forced to widen it in order to gain the requisite sectional area; and thus it carries away fresh stuff from the banks with the heavier particles of which the process is repeated lower down. If the river banks were of sound tough soil and of sufficient height not to be topped by floods, the channel would probably remain permanent. There is a case in point on the River Ravee. The "Sidnai" which may, I suppose, be translated "straight canal," is a beautifully straight reach of the river extending from Kuchroomba (about two miles below Tolumba) to Ramchountra, a Hindoo shrine standing on the very edge of the river about 2½ miles above Siddoo Seraie. This reach is so straight that looking down it you can perceive no turning. Its length is between 7 and 8 miles, its width from 500 to 700 feet. The banks are of good firm soil, nothing extraordinary, and they are high enough not to be topped to any extent in floods. The "Jullars" (Persian wheels) remain undisturbed on the banks the whole year round, irrigating a narrow strip along both banks, which are beautifully fringed with trees to the very water's edge. But walk a thousand feet to one side and you are in the "Bar" (dry jungly desert). The River Ravee both immediately above and immediately below this reach is more crooked and shifting than any other river of the Punjab. Here it never alters. The native tradition is that the Creator, walking along the Ravee one day, was so disgusted with the crookedness of its course that he gave it a violent kick with his foot about Tolumba, thus compelling it to flow in a straight course for seven miles at least.

8. However, to return to Mr. Bourne's theory, I should say that by abstracting a large portion of its volume from a river on its issue from the hills, we might so reduce the velocity of the current that it would no longer be able to carry along the heavier particles of silt which would therefore be deposited at a smaller distance from the hills than they previously were.

9. But I do not think there is any necessity for being so fearful of injuring the navigable capabilities of the River Indus. On the contrary I should say "convert your Inundation Canal into a permanent one laid out expressly for steam navigation, as well as for irrigation, and you will possess a watery highway ten thousand times more valuable than that provided by any river (I was going to say in the world, but at all events) in India."

10. There are other objections to an Inundation Canal. The width (half a mile at the head!) Mr. Bourne is *necessitated* to give, in order to take in his supply of water, appears to me to be too great in proportion to the depth which he has set down at six feet only. How is the stuff to be run out from this shallow valley, not only during its first excavations but also in the annual silt clearances! Perhaps he purposes getting to the surface level of the country as quickly as possible and then embanking? I suspect the natural irregularities of the ground would upset any such scheme. But the fact is that without sections

Is he though, for a permanent Canal? See Postscript.—J. H. D.

[*P. W. Dept.*] of his proposed line, there is no giving an opinion one way or another, and no plan even accompanies his proposals. If the canal is to be dry for six months in the year, what are the settlers to do for drinking water during that interval? I would be sorry to condemn any one to drink the water of the "Thull" for that period.

11. I should be inclined to substitute Falls for Dams in places where excessive slope in the country has to be overcome.

12. I look on the "thriving English community" of settlers as a chimera. Thoroughly persuaded as I am that we cannot have too many Europeans in India, I would not choose the Sindh Saugor Doab as their location. I think they would die there simply; however it will be time enough to think of that when the water has begun to flow in the new canal.

MEMO.—The hot weather is the time for agricultural operations with Inundation Canals.—J. H. D.

13. So much for feasibility. As to expediency, I would be inclined to give the "Thull" and the water and welcome to any one who would construct a navigable Canal of Irrigation throughout its entire length, Government retaining the right of taking over the whole at a fair valuation after a certain term of years. I must add, however, that I do not think it would be wise for Government to allow any private money even to be spent disadvantageously in India. It may be said that is the look-out of the people who choose to throw away their money; very true, but the *result* would be to throw a damper on all private enterprise, and to push back for years schemes which would really pay well. Much is to be expected from private enterprise in India, but its course must be directed at the outset with skill and caution.

14. I would recommend that Mr. Bourne be requested to go a little more into detail, and to supply plans and sections of his proposed canal. It will then be possible to give a determinate opinion on the subject.

P. S.—It may be of some use to Mr. Bourne, as well as pleasant for him to know, that for the irrigation of his Doab of 200 miles long by 50 miles wide, it is not necessary to make a canal "more than half a mile wide at the head." From his starting with "cubic yards per hour" in order to arrive at "cubic feet per second" I perceive that he has got hold of some Madras data, which have always appeared to me to be inapplicable to this part of India. It is true that he estimates for the irrigation of rice, but surely he does not seriously propose to grow rice in soil which he says "consists of sand." Other crops than rice would probably be found to answer better; and as sandy soil really requires less water in irrigation than clayey soils, we have some set-off against the loss by percolation, which would be very great until the canal water had puddled its own channels, as it always does if the soil through which it runs is not impregnated with salts. Besides, irrigation from a new canal never comes into play all at once, so that at first, and indeed for several years after the construction of a new canal, there is plenty of water to spare. The natural puddling effected by the running water depositing the finer particles of silt in the interstices between the particles which compose the natural soil forming the banks

and bed of the canal channels is generally completed by the time the demand for more water begins to be seriously felt. [*P. W. Dept.*]

I now add some data by which in the North-Western Provinces and the Punjab we were accustomed to estimate the quantity of water required for the irrigation of a given area of country.

It has been ascertained by actual measurement that in "highly irrigated" Districts about one-third of the total area only is actually under irrigation at any given time.

It has also been ascertained that one cubic foot of water per second of the discharge of a permanent Canal of Irrigation is sufficient to irrigate throughout the year 218 acres of ground, that is, with average crops (not all rice), and on the supposition that the water is not wasted.

A cubic foot of water per second may therefore be taken as the quantity required for the irrigation of a square mile of country, that is, to place it under the denomination of "highly irrigated."

The area of Mr. Bourne's Doab is (200+50) 10,000 square miles, and his canal should therefore be capable of receiving at its head 10,000 cubic feet of water per second, or about one-half more than the discharge of the Ganges Canal. It would of course be as well to make some extra allowance in consideration of the nature of the soil passed through, but I do not think he need multiply his actual requirements by six, as he has done.

From CAPT. J. G. MEDLEY, *Engrs., Depy. Cons. Engr., to Secy. to Govt. of Punjab,—No.* 110, *dated 7th February* 1859.

I HAVE the honour to acknowledge the receipt of your letter No. 295, dated 3rd instant, enclosing documents connected with a proposal for reclaiming and irrigating the waste lands of the Sindh Saugor Doab, and calling for my opinion thereon.

If parties can be found able and willing to spend money in reclaiming that desert, on condition that the land so reclaimed shall become their property, it certainly seems to me to the direct advantage of Government to close with the proposal.

It is extremely unlikely that any steps in this direction can be taken by Government itself for a very long time to come. The Lieutenant Governor has recorded his opinion (in which most people capable of judging will concur) that it is unadvisable for Government to spend more money in great schemes of irrigation for increasing the produce of the land until Railways or navigable rivers are found to carry that produce away, and the next great canals to which the attention of Government will be turned when the time arrives will be undoubtedly that from the Sutlej to irrigate the country east of

[*P. W. Dep.t*] that river, and a canal from the Chenab to irrigate the Rechna Doab, both of which appear to promise a better return for the Government outlay than the irrigation of the Sindh Saugor Doab by a canal from the Indus.

I am of course not a competent judge of the advantages or disadvantages of the Government admitting a proprietary right in the soil by a Joint Stock Company, but the improvement of the desert in question, the construction of roads, &c., and the location of a European population in the proposed tract, would all be advantages more or less direct to Government, and which they are not, as I have said above, likely to obtain for a very long time to come by their own means.

It seems too so highly desirable to introduce private European capital and energy into this country, that Government would naturally do all that lay in its power to encourage such projects in general. On the other hand for this same reason it is not advisable that schemes should be encouraged, which, if resulting in failure, might tend to throw cold water on other efforts which might be more promising and successful.

The principal feature in Mr. Bourne's scheme, viz., the construction of a canal from the Indus at Kalabagh, is perfectly feasible without doubt. I myself brought the subject to the notice of the Director of Canals more than three years ago, and requested permission to make the necessary preliminary surveys. The chief obstacles to the success of the whole scheme as a commercial speculation, would be the scantiness of the population, and the consequent slowness of return in the way of money paid for the water supplied, and the hostile nature of the climate in common with that of the Indian plains in general to the health of the projected European colonizers.*

* The wells in the interior are brackish to a degree, though this would be remedied afterwards by the canal water.

As to the details of the work itself, Mr. Bourne proposes only a canal that shall be filled during the hot and rainy seasons when the river is at its highest. He seems to fear the expense and difficulty connected with the construction of the dam at the head that would be necessary to supply the channel with water during the cold weather, and he seems to think that the abstraction of so much water when the river is at its lowest, might seriously impede the navigation. The latter fear is I believe purely chimerical. The quantity of water in the Indus at Kalabagh taken at its lowest level may be reckoned at 15,000 cubic feet per second, and the abstraction of only a seventh part of this would supply a stream as large as the new Baree Doab Canal, and would not, I am sure, at all interfere with the navigation of the river.

Again, I see no reason to doubt that a very efficient regulating dam could be thrown across the river immediately *below* its emergence from the hills, without any inordinate expense, compared with the cost of the whole project, and probably cheaper than the cutting through the rock immediately *above*, as proposed by Mr. Bourne.

Whereas to be content with a canal that should flow only through the hot months would be to lose all the advantages of the *Rubbee* or spring crop, the most profitable of the

two; while the *Khurreef* or autumn crop that could alone be irrigated, would require his [*P. W. Dept.*] European farmers to labour at the most unfavourable season of the year.

For the above reasons I should decidedly recommend that if the canal is to be made at all, it should be constructed to flow all the year round. Its head would be at Kalabagh, and it might rejoin the Indus or tail into the Chenab (according to the levels) somewhere below Mooltan. Its length would thus be about 200 miles; its discharge of water might be about 2,500 cubic feet per second; and its cost might safely be reckoned under three-quarters of a million sterling. Such a canal would actually water 5,45,000 acres of land, or on the ordinary calculation in Upper India that irrigating villages actually water one-third of their total areas, it would afford irrigation to an area of more than 2,500 square miles, quite as much as could reasonably be expected to be required for a long time to come.

The whole of the Sindh Saugor Doab is not, as Mr. Bourne fancies, a desert of sand. For the first 50 miles of its course the canal would run through a soil of red clay, which is, I believe, rich and fertile.

The sandy soil below would produce excellent wheat (as in the Murwhat country on the other side of the river), and this is an additional reason for looking to the spring crop rather than to the other.

An Engineering difficulty will have to be overcome in forming the Channel through the drifting sand, and much water will be lost by its percolation through such a soil; but I believe it would be found that the bottom and sides of the canal would gradually be lined with a deposit of silt that would render the channel water-tight.

The returns of such a canal* from direct water rent alone would, judging from others already constructed, probably amount *eventually* to 10 per cent. upon the invested capital after paying cost of maintenance, &c., while including the consequent increase to the Revenue, they might be expected to reach 25 per cent. judging fairly from past experience, but in such a thinly-peopled country, this return could not be expected for some years to come.

* If constructed by Government.

If Mr. Bourne's project were limited to the construction of the canal with the view of profiting by the water rent alone, the scheme would be more simple and feasible, and I think more likely to be successful. The Company would get a fair return for their money from the water rent mills, transit dues, &c., and an arrangement might be entered into with Government that they should receive a certain proportion of the increase to the Land Revenue that would accrue to the State from the new land brought under cultivation. The two together would, I am pretty sure, pay a handsome profit to any Joint Stock Company that should thus invest their capital.

[*P. W. Dept.*]

APPENDIX F2.

NOTIFICATION.—*By the Govt. of India, P. W. Dept., No.* 138, *dated* 23*rd May* 1859.

THE Hon'ble the Lieutenant Governor of the Punjab having officially announced the first admission of water into the Baree Doab Canal on the 11th of April, His Excellency the Governor General in Council is unwilling to let this event pass without public notice.

It is true that the project is still far from complete. But the mass of the heavier works having been constructed, all the chief difficulties having been overcome, and so notable a point in the history of the undertaking having been attained, His Excellency considers that the recognition merited by the Officers who have contributed to these results should not be deferred.

And these considerations are enforced by His Excellency's desire that this recognition should reach Captains Dyas and Crofton, the two Officers who have been the leading spirits in this enterprise from its commencement, before they quit India. For failure of health under the unflagging exertions of nine years compels both now to visit Europe.

It is with rare satisfaction that the Governor General in Council turns from the anxieties that have lately weighed so heavily on the Government of India, to contemplate the progress of a great work of peace and amelioration.

The initiation of this enterprise connects itself with the honoured name of Sir Henry Lawrence, and the first rough surveys were made at his instance under the direction of Sir Robert Napier.

The Punjab War of 1848 cut short these beginnings, but, soon after its termination, the scheme was taken up again with a more defined and larger scope.

The project was sanctioned by Lord Dalhousie's Government in 1851, and in September of that year the Canal was commenced.

From the first the charge and responsibility of the work, as regarded both design and execution, fell on Captain (then Lieutenant) Dyas, aided by Lieutenant Crofton.

First to Captain Dyas on this occasion are therefore due the thanks of the Government, in whose estimation he holds so high a place. With eminent sagacity, zeal, and constancy through years of indifferent health, he has directed the work, and His Excellency in Council heartily congratulates him on having been permitted to see, so far, the successful result of his designs and toil. All who have seen the works bear testimony to their excellence. The regularity and method with which the accounts have been furnished are no less exemplary, and perhaps more rare.

Captain Crofton is entitled to share very largely in these acknowledgments, as he has shared from the commencement in the labours of survey, of design, of organization, and of superintendence.

The only other Engineer employed since the commencement of the Canal, who has been allowed to see it reach its present advanced stage, is Mr. J. D. Smithe, now Superintendent of the Canal Workshops at Madhopoor. The Governor General in Council desires specially to recognise this gentleman's merits. [*P. W. Dept.*]

To the services of these Officers His Excellency has pleasure in adding, as deserving of acknowledgment on this occasion, those of Captains Gulliver and Fulton, of Mr. A. G. Crommelin, Mr. J. Kelly, Mr. E. C. Palmer, Mr. H. Garbett, Mr. S. G. Hanna, and of Lieutenant R. Home.

Two Engineers who did excellent service on the works are not now living. Lieutenant Paton, an Officer of much promise, was cut off early. The name of Lieutenant Duncan Home, whom Captain Dyas pronounces to have been "the best Executive Engineer he ever had," will live as that of him who led the heroes of the Cashmere Gate.

Two others who survive though no longer connected with the Canal, His Excellency in Council, desires to tender his approval and thanks. Of these the first place is assigned to Mr. W. Lloyd, whose aid for several years was most valuable. Major Macleod Innes, Lieutenant Earle, Messrs. J. G. Anderson, G. N. Dodd, and Lieutenant Swetenham also merit commendation.

Of the Subordinate Officers employed, Captain Dyas has named as worthy of prominent mention, Butler, Sparling, DeBacker and Marshall, Gereson, Duggan, Cox, Robinson, Taylor, Baness, McGuffin, Lester, Robson, and Conolly.

In conclusion, His Excellency in Council congratulates the Lieutenant Governor on the event which His Honour justly regards with so much interest, and wishes this great work God speed for the future. In a few months, it is confidently hoped, the new Channel will bear water to Lahore. But His Excellency trusts also that not many years may pass before the whole project shall have been realized, and the Canal and the Railway shall run side by side down the ridge of the Doab, desert no longer.

H. YULE, *Lieut. Colonel,*
Secy. to the Govt. of India.

[P. W. Dept.]

APPENDIX G.

ACCIDENTS ON RAILWAYS IN INDIA DURING THE YEAR 1859.

Two Returns in the usual form are submitted, one showing all accidents attended with injury to life or limb, giving the numbers of persons killed or injured from all causes; the second showing the nature of all accidents, whether collisions, engines, or carriages leaving the line, accidental, &c., &c.

A third Return is also attached, showing the comparative number of passengers killed or injured, with reference to the numbers carried, and also as compared with accidents on English Railways.

Accidents attended with Injury to Life or Limb.

1. ACCIDENTS TO PASSENGERS.

East Indian Railway, Bengal Division.

During 1859 there have been four accidents to passengers on the Bengal Division of the E. I. Railway, one of which was fatal. It occurred to a Syce travelling in charge of Government horses, who, for some cause or other, was sitting with his body half out of the horse-box, while the train was being shunted from one line of rails on to another, and coming in contact with the shutter of a window of the Coal Weighing House, was knocked down, and falling across the rails the wheels of the wagon passed over him, crushing both arms and mangling his left leg, and he died from these injuries. No one but the man himself was in any way to blame for this; but a recommendation was made that the shutters might be altered to open inwards instead of outwards.

Of the three passengers injured, the first accident, which occurred at Bally on the 5th January, was to a Portuguese who was travelling in a 3rd class carriage, and who, on arrival at Bally, got out for some purpose, and after the train had started tried to get into the carriage again, and catching hold of the foot board in his attempt to do so came in contact with the station platform, and had his arm broken.

The second case occurred at Boinchee, where, when the train was passing, a 3rd class passenger jumped out and met with severe injuries.

The third case was at Muggra, where, owing to the platform not being sufficiently long, an aged man, a 3rd class passenger, getting out of the train, stepped on to the parapet wall of a bridge, and then losing his balance fell on to the road beneath and broke his leg. Arrangements have since been made for lengthening these platforms.

East Indian Railway, N. W. Provinces.

One passenger, on the 24th March, finding his clothes had caught fire from sparks from the Engine, was so frightened that he jumped out of the carriage while the train was at full speed; he was severely injured, and died in consequence.

Madras Railway. [*P. W. Dept.*]

There were no accidents to passengers on the Madras Railway during 1859.

Great Indian Peninsula Railway.

Four passengers were killed and six injured during the year 1859.

On the 28th April, owing to a bridge giving way, five vehicles were thrown off the line, when four passengers were killed and four injured.

On the 13th January, as a female passenger was leaving the Khandalla Station platform, she was struck by a fragment of a rock from some excavation and injured.

And on the 31st July, a passenger attempted to jump out of a carriage that had been thrown off the line, and was injured.

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2. ACCIDENTS TO SERVANTS OF THE RAILWAY COMPANY, OR PERSONS EMPLOYED ON RAILWAYS.

East Indian Railway, Bengal Division.

There have been 13 cases of this nature, of which eight proved fatal; they were as follows:—

1st.—A Permanent Way Cooly belonging to the Ballast Train received some injuries, of which he died; how, the authorities were unable to discover.

2nd.—A female Cooly engaged in pushing a truck got her foot injured by the wheel passing over it, and she subsequently died in hospital; but it was not clearly ascertained whether or not death ensued from the injury, or from any other cause.

3rd.—A Cooly sitting carelessly on the edge of a Ballast Truck, while the train was in motion, fell off and was killed.

4th.—A Cooly propelling a Ballast Wagon on one line of rails turned on to the other line just as a train was passing; was caught by the Engine buffer, knocked down and killed.

5th.—An European Inspector named Allen jumped off the up-platform of the Burdwan Station just as some wagons were being pushed through the station; he slipped, and falling across the rails the wheels of the wagons passed over his legs, causing such severe injuries that, notwithstanding the greatest care being taken of him, he died about a week afterwards.

6th.—A Cooly employed in trimming the hedges, in walking home from his work during a heavy storm, walked along the Railway, a train coming up from behind, which it is supposed he did not hear owing to the storm, knocked him down and killed him.

7th.—A Native Pumpman employed in the Locomotive Department at Hooghly Station got killed whilst attempting to jump on to the Tender while the train was in motion; he fell, and the wheels passed over him.

[*P. W. Dept.*] 8th.—A Porter at Undal riding carelessly on a wagon that was being shunted, came in contact with the platform, and his leg was cut off and body so much injured that he died before he could reach Raneegunge.

The cases in which injury to limb happened were as follows :—

1st.—A Cooly injured his foot while moving some Ballast Wagons.

2nd.—Through a Pointsman's carelessness at Beddiah the Engine of a train was turned on one line, and the trucks on to another, from which cause the Engine and six trucks got off the line, and the Engineman was slightly hurt.

3rd.—A Native workman jumped out of a truck while the train was in motion, and had two of his toes cut off.

4th.—Inspector Thompson went to sleep lying on the Railway, and on some wagons coming up the Coolies did not awaken him in time, and by some means or other both his ears were cut off by the wheels of the wagons.

5th.—A Cooly trying to jump into a Ballast Train in motion fell with his arm across the rail, and the wheels went over it.

Besides these accidents on the line, a lascar was killed in Howrah Workshops by being caught in the machinery. A woman employed on the Station works at Burdwan fell from the scaffolding, and was seriously injured ; and an Engine Driver threw his Native fireman off an Engine ; no injury, however, seems to have been caused to the fireman, but the Driver was removed from the Railway Company's service.

East Indian Railway, N. W. Provinces.

Fifteen people employed by the Railway Company were killed or injured during the year ; of these one European and seven Natives were killed or died from their injuries ; the following are the particulars of these cases :—

1st.—A European Guard of the train, named Robertson, missed his footing while stepping from the Sirsoul Station platform into the Break Van after the train was in motion fell and was instantaneously killed.

2nd.—A Cooly in Railway employ tried to cross the line in front of a train moving at 20 miles an hour, but was caught by the train and killed.

3rd.—A Cattle Wagon took fire, and two water Coolies who were in it jumped out, and were injured very badly ; one of them died.

4th.—While shunting some trucks a Native boy got between the buffers of two trucks, and his head was crushed.

5th.—Two trucks being pushed along the line came in contact, and of the coolies (who it seems had all jumped into the trucks while running down an incline) three were thrown out and severely injured, one dying of his injuries.

6th.—A Cooly jumping off a truck in motion met with an injury.

7th.—A Cooly, through his own carelessness, fell out of a train and broke his leg. [*P. W. Dept.*]

8th.—The Pointsman at the triangle at Bairampoor holding the points carelessly, got his foot cut off by the wheel of the Engine.

9th.—A Cooly trying to remove some obstacle from the line while propelling a wagon, fell, and a loaded wagon passed over him, fracturing his thigh bone; amputation was performed, but the man died next day.

10th.—A Native trying to get into the Tender of the Engine in motion, fell, and was run over, his leg being nearly severed from his body; he died almost immediately after being conveyed to the hospital.

11th.—A female Cooly pushing a truck in front of a second truck slipped while walking, and falling on the line was run over by the truck following; her leg and heel being crushed, amputation was performed, but mortification ensuing she died.

12th.—A Cooly trying to climb upon a carriage in motion, fell, and had his foot cut off.

Madras Railway.

Three accidents, all of which were fatal, occurred to servants of this Company during the year, the particulars of which were as follows:—

1st.—A Greaseman tried to get out of the Break Van while the train was in motion; he fell under the Van and was killed.

2nd.—A line Watchman waiting for a train long over-due, laid down with his head on the rail, and falling asleep in that position, was killed by a blow on the head from the Rail Guard of the Engine.

3rd.—A Gate-keeper trying to save a pet sheep which had gone on to the line just as a train was coming, was himself knocked down and killed by the buffer of the Engine.

Great Indian Peninsula Railway.

Five persons in the employ of the Railway Company or Contractors have been killed, and 11 injured during the year; the particulars are as follows:—

1st.—A Porter was killed, who fell in trying to get on an Engine, which passed over his legs.

2nd.—A Cooly was caught between the buffers of two wagons.

3rd.—A Gateman was run over in attempting to cross the line.

4th.—A child coming out of a building in the Station Yard was run over by an Engine.

[*P. W. Dept.*] 5th.—A child got his head jammed between the buffers of two wagons.

INJURIES.

1st.—A Guard fell from a carriage in motion when trying to shut the door.

2nd.—A Guard injured on the occasion of five vehicles getting off the line, owing to a bridge giving way.

3rd.—A Cooly knocked down by a train.

4th.—A Guard falling from a Break Van.

5th.—A Gateman knocked down by an Engine while standing too near the line.

6th.—A Native Fireman injured by a train running into an Engine pit under construction.

7th.—A Mr. Lee struck by a log of timber that fell off a wagon.

8th.—A loading Inspector fell from a carriage while shunting some wagons.

9th.—A man fell and had his foot injured when trying to get into a wagon in motion.

10th.—A boy caught between the buffers of two wagons and injured in the head.

11th.—A Policeman run over by a train on an incline.

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3. ACCIDENTS TO PERSONS NEITHER PASSENGERS NOR SERVANTS OF THE RAILWAY COMPANIES.

East Indian Railway, Bengal Division.

TRESPASSING.

THREE people were killed, while trespassing on the line, in the following manner :—

1st.—A woman trespassing on the line at night was knocked down and killed by the night Mail Train.

2nd.—A woman trespassing on the line moved from one line on to another just as a train was coming, and was knocked down and killed.

3rd.—A man in trying to drive a buffalo off the line was caught by the Engine and killed. [*P. W. Dept.*]

SUICIDE.

A European Soldier, a Sergeant in one of H. M.'s Regiments, threw himself out of a train when at speed; was picked up and taken to Barrackpoor, where he died.

East Indian Railway, N. W. Provinces.

TRESPASSING.

A Native endeavouring to cross the line near Cawnpoor was knocked down and killed.

SUICIDE.

A Native on the 16th June placed himself in front of the Engine near Sirsoul and was killed.

Madras Railway.

There were no persons killed or injured on this Railway either by trespassing or suicide.

Great Indian Peninsula Railway.

TRESPASSING.

Three people were killed and two injured while trespassing on this line—

1st.—A woman trying to cross the line was caught by the Engine and killed.

2nd.—Two *Biggaries* returning home along the line did not keep clear of the Rails; one of them was killed, the other injured.

3rd.—A Grass-cutter was run over by the train from Wassind and killed.

4th.—A Merchant's Clerk going about the yard at Bombay, was caught between the buffers of two wagons and injured.

SUICIDE.

Nil.

[*P. W. Dept.*] 4. MISCELLANEOUS ACCIDENTS, AND ACCIDENTS FROM COLLISIONS, OR ENGINES OR CARRIAGES LEAVING THE RAILS.

East Indian Railway, Bengal Division.

A 3rd class carriage was burnt in Howrah Yard owing to the carelessness of some Natives smoking near it.

1st.—Three wagons were thrown off the line at Raneegunge owing to the negligence of a Pointsman, damaging three pairs of points and breaking three chairs.

2nd.—An Engine and six trucks were thrown off the line at Raneegunge through the carelessness of a Pointsman.

3rd.—A very slight collision occurred at Burdwan, breaking the buffers of a goods truck; it occurred owing to a block-up of the Burdwan Station by several trains being there.

East Indian Railway, N. W. Provinces.

Detention of trains caused by a trifling injury to an Engine on 21st January.

A similar detention from a like cause on the 26th January.

On the 3rd February, owing to the Engine tubes leaking badly, the trains were delayed for 7 hours.

On the 8th April an Engine and some timber trucks got off the line, owing to some points not being properly fastened down; three sleepers were broken and the points bent.

On the same day the sparks from the Engine set a carriage (that was being conveyed by train) on fire, and it was completely destroyed.

On the 24th April, from the same cause, a loaded truck took fire, and a considerable quantity of private goods were burnt.

On the 8th August, owing to a Pointsman not holding the points properly, a loaded truck got off the Rails, breaking 21 chairs.

On the 18th October an Engine was thrown off the line, owing to a Pointsman leaving a scotch block across the line; a few chairs were broken.

On the 8th November another fire took place owing to the sparks from the Engine, by which a large quantity of passengers' and soldiers' luggage was burnt.

On the 16th December a slight collision took place, owing to a Pointsman shunting [*P. W. Dept.*] a train by mistake on to a wrong line; the buffers were broken of five wagons and the Engine.

On the 18th of December the Engine was driven against the bank at the end of the triangle at Bairampoor, damaging a fire-wood truck, 9 chairs, 2 bolts, and a switch rod.

Madras Railway.

Three accidents happened from Engines and carriages leaving the rails.

1st.—An Engine and two wagons running over a buffalo, threw the three succeeding vehicles off the Rails.

2nd.—An Engine and Tender got off the Rails through the carelessness of a Pointsman who allowed the leading wheels to take the main line, and then pulled the switch tongues well over, turning the rest of the Engine wheels and the train into a siding; three rails were much bent, and several chairs broken.

3rd.—Owing to the defective condition of the Permanent Way, the last 10 wagons and the van of a train got off the line, bending some rails, breaking 30 or 40 chairs, and a number of the axle bearings of the wagons.

Great Indian Peninsula Railway.

A large number of miscellaneous accidents occurred on this Railway; no less than 44. Of these 13 were caused by the train running over bullocks or buffaloes, one by its running over horses; four were purely accidental; four were slight collisions almost entirely caused by carelessness of Drivers or Pointsmen, and no less than 18 occurred in consequence of the absence or carelessness of some of the employés of the Railway Company, such as Gatemen, Pointsmen, Guards, &c., &c. One was caused by a spark from an Engine setting a truck on fire; one by defects in the Permanent Way; one occurred owing to a van not having been properly secured, being caught by the wind, put in motion, and driven violently against some wagons.

The most serious one of all was the one noticed under the head of injuries to passengers, when, owing to a bridge giving way, five carriages were thrown off the line.

REMARKS.

A comparison of these Returns shows that fewer accidents have occurred on the Madras line than on either of the others, and that a large number have occurred on the Bombay Railway. It further appears that of the regular accidents only one in Madras was caused by negligence of Railway Company's servants; two in the Bengal Division of the E. I. Railway from this cause; four in the North-West Provinces Division of the E. I. Railway; and the large number of 24 on the G. I. P. Railway.

Regarding accidents to passengers the Returns will, I think, be looked on as very favourable. In Bengal none were killed, and only one passenger was injured from causes

[*P. W. Dept.*] beyond his own control. In Madras none were either killed or injured; and in Bombay only one serious accident happened, when, from a bridge giving way, four people were killed and four injured.

The proportion per million carried, killed, or injured, as compared with the Returns on Railways in Great Britain, is very favourable as regards Bengal and Madras, and taking the total of all Indian lines, it is also still very favourable as regards passengers injured; but owing to the comparatively small number of passengers carried altogether in India, as compared with Great Britain, a single accident throws the average behind.

Several accidents from trucks catching fire from sparks from the Engines in the North-West Provinces, where wood fuel is used, are reported; but it is noticed that now spark bafflers, as in use on the American Railways, are supplied, and accidents from this cause reduced in number, if not altogether stopped.

A number of coolies and other workmen employed on the opened line having met with serious accidents, chiefly, however, through their own inattention to the rules laid down, the Government addressed the Agent of the E. I. Railway on the subject, who in consequence issued a circular to all the Railway Company's employés, a copy of which is appended.

In Bengal, of the two accidents caused by negligence of the Railway Company's servants (in neither of which, however, were any passengers injured) one was caused by a Pointsman neglecting his duty; he was immediately made over to the Civil Authorities, and was sentenced to 12 months' imprisonment; the other case being of a very trivial nature, the man was only warned.

Of the five cases of accidents from negligence of servants on the North-West Division of the E. I. Railway, one was owing to a Pointsman not holding the points properly, but no mention is made whether he was punished or not.

The second case, being caused by a Pointsman leaving a scotch block unlocked, was followed by the man's dismissal.

The case of collision caused by a Pointsman's neglect was followed by the man being sentenced to 3 months' imprisonment.

In the case of the Guard being killed by falling between the platform and train, it was proved that the man himself being intoxicated was alone to blame.

The other case, that of the Pilotman driving an Engine against the bank of the triangle, was punished by fine.

No report is made whether the Pointsman at Madras, through whose carelessness an Engine and Tender were thrown off the line, was punished or not.

It is also not stated whether any steps were taken to check the numerous instances at Bombay of Pointsmen, Gatemen, &c., sleeping at their posts, or leaving them, or whether, in any of the cases reported, any punishment was awarded; but the number of such cases is so large, that it is evident some very stringent measures are required to put an end to them.

F. S. STANTON, *Capt.*,
Depy. Cons. Engr. to Govt. of Bengal.

The 4th July 1860.

RETURN No. 1.

Number of persons killed and injured from all causes on Indian Railways during 1859.

	East Indian Railway.				Bombay, G. I. P. Railway.		Madras Railway.	
	Bengal Division.		N. W. P. Division.					
Passengers.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Passengers killed or injured from causes beyond their own control ...	.....	1	.....	.....	4	5	.....	.....
" " owing to their own misconduct or want of caution	1	2	1	.....	.....	1	.....	.....
Total Passengers killed or injured	1	3	1	.....	4	6	.....	.....
People connected with the Railway.								
Servants of the Company or of Contractors killed or injured from causes beyond their own control	1	1	1	.....	.....	4	.....	.....
Ditto owing to their own misconduct or want of caution	7	4	7	7	5	7	3	.....
Total Railway People	8	5	8	7	5	11	3	.....
Others neither Passengers nor Railway Company's Servants.								
Trespassers	3	.....	1	.....	3	2	.....	.....
Suicide...	1	.....	1	.. ...	.. ...	.....	.....	.. ...
Total persons unconnected with the Railway ...	4	.....	2	.. ...	3	2	.....	.....
Grand Total, killed or injured	13	8	11	7	12	19	3	.....
Mean length of Railway open during year	150		120		205		96	
Number of Passengers carried	13,88,714		... ...		12,10,607		5,13,179	

[P. W. Dept.]

RETURN No. 2.

Statement of Accidents upon Railways in India during 1859, *showing the nature of accidents and number of persons killed or injured thereby.*

Nature of Accidents.	No. of Accidents.	Passengers or persons unconnected with the lines.		Causes of Accidents.												
				Purely accidental.	Causes arising from Rolling Stock or Road.				Causes attributable to the management.					Negligence of servants.	Improper interference by persons not under the control of the Company.	Malicious attempt of persons not under the control of the Company.
					Neglect of		Defective condition of		Defective discipline.							
									Unpunctuality.							
		Killed.	Injured.		Machinery of Train.	Road.	Machinery of Train.	Road.	Accidental.	Defective or inadequately enforced system.	Insufficient or inadequately enforced Regulations.	Defective system for recurring intervals between trains.				
E. I. Railway, Bengal Division.																
Accidents from Engines or Carriages leaving the Rails.	2	...	...	...	...	...	...	...	...	...	...	...		2	...	...
" from Collisions	1	...	...	1	...	...	...	...	...	...	...	...		...	...	...
" from Trains running through facing points.	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...
" from persons in Train being struck against works adjacent to the line	1	1	...	1	...	...	...	...	...	...	...	...		...	...	...
Accidents, Miscellaneous	1	...	...	...	...	...	...	...	...	...	1	...		...	...	...
Total ...	5	1	...	2	...	...	...	...	...	...	1	...		2	...	...
E. I. Railway, N. W. Provinces.																
Accidents from Engines or Carriages leaving the Rails.	3	...	...	...	...	1	...	...	...	...	..	...		2	...	...
" from Collisions	1	...	...	...	...	...	...	...	...	...	...	...		1	...	...
" from Trains running through facing points.	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...
" from persons in Train being struck against works adjacent to the line	1	...	...	...	...	...	...	...	...	...	...	...		1	...	...
Accidents, Miscellaneous	9	...	...	...	...	...	8	...	...	...	...	...		1	...	...
Total ...	14	...	...	...	...	1	8	...	...	...	...	...		5	...	...

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[*P. W. Dept.*] *Statement showing the number of Passengers carried and those killed or injured from causes beyond their own control.*

1859.	Total number of Passengers carried.	Total Number.		Proportion per Million.	
		Killed.	Injured.	Killed.	Injured.
East Indian Railway, Bengal	13,88,714	... ...	1	·00	·72
Madras Railway	5,13,179	.....	... ...	·00	·00
Great Indian Peninsula Railway ...	12,10,607	4	5	3·304	4·13
Total	31,12,500	4	6	1·28	1·92
Average on Railways in Great Britain	139,000,000	... ...	.....	·15	3·19

N. B.—No Returns of number of Passengers carried in the North-West Provinces Section of the E. I. Railway having been received, that portion of Railway is omitted in this Statement.

APPENDIX.

CIRCULAR No. 5996.

East Indian Railway Company.

NOTICE.

IN consequence of several accidents to Natives which have recently occurred on this Railway, and the circumstances with which they have been attended, the Agent has been requested by Government to issue a Circular, for the purpose of informing the Officers and servants of the Company, that they are expected to do every thing to prevent the occurrence of accidents, and that the heedlessness and apathy of the Natives require them to be doubly careful in this respect. In all cases of accidents the facts are enquired into by the Magistrate, and if the result of enquiry should prove that any accident has arisen through the neglect of a servant of the Company in not adhering to the standing rules laid down for his guidance, the person in fault will be dealt with as strictly as the law will permit. If it should appear that any servant of the Company has neglected any reasonable precaution, which might have averted the accident, he will be liable to be punished by removal from his situation.

The present opportunity is taken to point out that it is expected that every assistance, in cases of accidents, will be rendered to the Magistrate, and especially that the prompt attendance of witnesses will be provided for by the Officials of the Railway Company.

Calcutta, 20th July 1859.

EDWARD PALMER,
Agent.

APPENDIX H.

[*P. W. Dept.*]

Extract from the Proceedings of the Right Hon'ble the Governor General of India in Council, dated 17th May 1589.

OBSERVATIONS.—Certain claims for compensation for losses of property by fire, while in transit between Allahabad and Cawnpoor, having been laid before His Excellency the Governor General in Council, it was deemed advisable to take the opinion of the Advocate General respecting the several liabilities of the parties concerned.

2. H. E. in C. observes that the opinions of the Advocate General should, wherever practicable, be directly applied in dealing with these claims.

3. Thus, claims for goods booked by Bullock Train and destroyed on the Railway, must be paid at once by the Government through the Post Office Department, unless notice was given to the sender that the Government would not hold itself responsible, and unless the transfer of the goods to the Rail was consented to by the sender.

4. Passengers will also recover from the Post Office the value of baggage destroyed in cases where they have paid for their tickets to the Post Master at the Post Office rates. This right of recovery, however, being limited to the regular quantity of baggage allowed by Post Office rules to go free, and being admissible only where no notice was given to the traveller that Government did not hold itself responsible for his baggage, and that it must be carried at his own risk.

5. Where travellers who thus obtained tickets had any baggage in excess of that allowed to pass free, and paid for it at the Dâk rates, the Government will also, in the absence of the notice indicated in the preceding paragraph, be liable.

6. Where such notice was given to the travellers, or where luggage in excess of that allowed to go free in Dâk Carriages was not paid for, the Government will not be responsible, and no payment will be made.

7. Persons to whom a free transit was granted by the Government, or who have made use of the Rail gratuitously under the permission of the Government, will have no claim on Government. For so much (if any) of their baggage as was booked, or became the subject of separate charge by the Railway Company, the Company may be held responsible to the owners. But for so much of their baggage as was not booked, and did not become chargeable, the owners are without legal remedy.

8. In cases where the Government becomes liable, as laid down in paragraphs 3, 4, and 5, the Government will have a claim against the Railway Company for reimbursement of compensation paid.

9. The Railway Company should, in the opinion of H. E. in C., be invited to settle the matter in doubt according to the principles suggested in the 20th paragraph of the Advocate General's opinion.

[*P. W. Dept.*] 10. If the charge made by the Railway Company against Government for the use of the Railway is limited to the full fares for the actual number of persons, and the actual quantity of goods carried, the Government will not demand any reimbursement of compensation for the destruction of personal baggage not booked and charged for in the regular manner, as on lines opened for traffic. Should, however, private individuals in such cases recover compensation from the Railway Company (which the Government does not consider probable) the Government must leave the Company to bear the liability.

11. Should, however, the charge of the Railway Company be found to be on any other basis, it will be for subsequent consideration whether the Government will agree to their demand, and to what extent the liability of the Company shall be held to go. The amount disbursed by the Government, and for which the Railway Company is held responsible, must be claimed from the latter, a fair allowance being made for any property destroyed before the Railway Company had sufficient time to discover and remedy the danger arising from the use of wood fuel.

12. The G. G. in C. further observes that the Advocate General advises the promulgation of a notice by the Post Office Department, disavowing responsibility for goods booked by Bullock Train when carried by Rail. Such a notice should be issued, and the Post Office Department will be directed to take the necessary steps in the matter.

ORDER.—Ordered, that the necessary communications be made to the Home Department and the Consulting Engineer on this subject, and that the attention of the Home Department be called to paragraphs 3 to 11 of the Advocate General's letter of the 29th January, with reference to the last paragraph of the preceding observations.

O. T. Cutter, Public Works Department Press,—1861.

CLASSIFIED ABSTRACT OF EXPENDITURE IN THE P. W. DEPARTMENT IN 1859-60.

BRITISH. FOREIGN.

State.	Roads.	Bridges.	Buildings (Including Staff.)	Irrigation.	C. W. Purposes.	Navigation.	Miscellaneous.	Total N. & M. Purposes.	Railways.	Guarantees.	Total Railways.	Miscellaneous Foreign Purposes.	Total Foreign.	Grand Total.
	Original Works. Repairs. Total.	Original Works. Repairs. Total.	Original Works. Repairs. Total.	Original Works. Repairs. Total.	Original Works. Repairs. Total.	Original Works. Repairs. Total.	Original Works. Repairs. Total.	Original Works. Repairs. Total.	Original Works. Repairs. Total.	Original Works. Repairs. Total.	Original Works. Repairs. Total.	Original Works. Repairs. Total.	Original Works. Repairs. Total.	Original Works. Repairs. Total.
A. Military.														
1 Fortifications	1,94,433	44,000	33	3,500	11,211	2,75,046	1,13,000	1,13,000					1,13,000	4,26,046
2 Cantonments	17,000	14,000	1,75,000	1,75,000	1,87,000	13,000		13,000	4,000	4,000	1,000	1,000	18,000	1,91,000
3 Accommodation, &c. Troops	8,61,716	11,12,000	1,00,000	1,00,000	21,73,716	91,824		91,824	1,50,000	1,50,000	2,000	2,000	1,52,000	23,25,716
4 Magazines	1,00,000	1,00,000	20,000	20,000	1,20,000	1,000		1,000	5,000	5,000	1,000	1,000	6,000	1,26,000
5 Communications	1,000	1,000	1,000	1,000	2,000	1,000		1,000	1,000	1,000	1,000	1,000	2,000	3,000
6 Roads	6,000	6,000	1,000	1,000	7,000	1,000		1,000						8,000
7 Surf	1,000	1,000	1,000	1,000	2,000	1,000		1,000						2,000
Total Military	3,01,149	11,77,000	14,00,149	1,95,500	1,00,000	2,95,500	4,15,649	13,15,000	28,30,649	1,97,824	1,50,000	3,47,824	3,50,000	1,97,824	1,52,000	3,49,824	17,79,824	1,97,824	1,52,000	3,49,824	21,29,648
B. Civil.	1,716	1,000	2,716	10,000	10,000	10,000		10,000						12,716				10,000	10,000	10,000	22,716
C. Ecclesiastical.														
1 Public	15,000	15,000	15,000											15,000
2 Court Houses	17,000	1,000	18,000	20,000	20,000				1,000	1,000	1,000	1,000	21,000	39,000
3 Jails	12,000	1,000	13,000	1,000	1,000				4,000	4,000	1,000	1,000	5,000	18,000
Total Judicial	44,000	2,000	46,000	21,000	21,000				5,000	5,000	2,000	2,000	7,000	72,000
D. Medical.														
1 Land and Miscellaneous	34,000	11,000	45,000	10,000	10,000				2,000	2,000	1,000	1,000	3,000	58,000
2 Canals	14,000	14,000	28,000	28,000										28,000
3 Opium	4,000	4,000	8,000	8,000										8,000
4 Salt	1,000	1,000	2,000	2,000										2,000
Total Medical	53,000	30,000	83,000	48,000	10,000				2,000	2,000	1,000	1,000	3,000	96,000
E. Educational.														
1 Buildings	5,000	5,000	10,000	10,000										10,000
2 Rental Grants	1,000	1,000	2,000	2,000										2,000
Total Educational	6,000	6,000	12,000	12,000										12,000
F. Scientific.	10,000	5,000	15,000	5,000	5,000	10,000	10,000	10,000	1,000	1,000	1,000	1,000	2,000	27,000
G. Civil.														
1 Government	25,000	10,000	35,000	10,000	10,000	45,000								45,000
2 Public Works	20,000	4,000	24,000	10,000	10,000	34,000								34,000
3 Post Office	1,000	1,000	2,000	2,000										2,000
4 Mint	15,000	5,000	20,000	20,000										20,000
5 Charitable Institutions	15,000	15,000	30,000	30,000										30,000
6 Records	1,000	1,000	2,000	2,000										2,000
7 Monuments and Antiquities	4,000	4,000	8,000	8,000										8,000
8 Miscellaneous	5,000	5,000	10,000	10,000										10,000
Total General	1,04,000	40,000	1,44,000	90,000	20,000	1,10,000	2,00,000	2,00,000	40,000	40,000	20,000	20,000	60,000	3,54,000
Total Civil	1,57,716	1,01,000	2,58,716	1,87,000	1,00,000	2,87,000	4,25,649	13,25,000	28,50,649	1,97,824	1,50,000	3,47,824	3,50,000	1,97,824	1,52,000	3,49,824	17,79,824	1,97,824	1,52,000	3,49,824	21,29,648
Internal Improvement.														
H. Military.														
1 Town Buildings														
2 Markets	4,000	4,000	8,000	8,000										8,000
3 Paving and Metalling														
4 Lighting	1,000	1,000	2,000	2,000					14,716	14,716				16,716
5 Water Supply														
6 Sewage	1,716	1,716	3,432	3,000										3,000
Total Municipal	1,716	1,000	2,716	1,00,000	11,000	1,11,000	3,716	3,716	14,716	14,716	1,00,000	11,000	1,11,000	1,31,432
I. Marine.														
1 Harbours and Navigation	1,140	1,140	2,280	2,280										2,280
2 Light Houses	10,000	10,000	20,000	20,000										20,000
Total Marine	11,140	11,140	22,280	22,280										22,280
J. Industrial.														
1 Mines														
2 Manufactures	1,000	1,000	2,000	2,000										2,000
Total Industrial	1,000	1,000	2,000	2,000										2,000
K. Agricultural.														
1 Irrigation Canals	2,00,000	2,00,000	4,00,000	4,00,000										4,00,000
2 Tanks	1,00,000	1,00,000	2,00,000	2,00,000										2,00,000
3 Drainage	1,000	1,000	2,000	2,000										2,000
4 Forests	1,000	1,000	2,000	2,000										2,000
Total Agricultural	3,02,000	3,02,000	6,04,000	6,04,000										6,04,000
L. Communications.														
1 Metalled Roads	5,00,000	1,00,000	6,00,000	1,00,000	1,00,000	6,00,000	1,00,000	1,00,000	7,00,000	7,00,000	1,00,000	1,00,000	8,00,000	15,00,000
2 Unmetalled Roads	1,00,000	1,00,000	2,00,000	2,00,000		2,00,000			2,00,000	2,00,000			2,00,000	4,00,000
3 Bridges	1,00,000	1,00,000	2,00,000	2,00,000		2,00,000			2,00,000	2,00,000			2,00,000	4,00,000
4 Rail Ways & Ferries	50,000	50,000	1,00,000	1,00,000		1,00,000			1,00,000	1,00,000			1,00,000	2,00,000
5 Navigable Canals	1,00,000	1,00,000	2,00,000	2,00,000		2,00,000			2,00,000	2,00,000			2,00,000	4,00,000
6 Road Improvements	1,000	1,000	2,000	2,000		2,000			2,000	2,000			2,000	4,000
7 Miscellaneous Works	1,000	1,000	2,000	2,000		2,000			2,000	2,000			2,000	4,000
Total Communications	9,52,000	5,52,000	15,04,000	11,04,000	1,00,000	12,04,000	1,00,000	1,00,000	13,04,000	13,04,000	1,00,000	1,00,000	14,04,000	27,08,000
M. Various Unclassed.	11,000	11,000	22,000	11,000	11,000	22,000	22,000	22,000	22,000	22,000	22,000	22,000	44,000	66,000
Total Internal Improvement	13,80,856	8,66,140	22,46,996	17,43,280	1,11,000	18,54,280	1,03,716	1,03,716	13,40,716	13,40,716	1,01,000	1,01,000	14,41,716	32,99,712
Total Works	28,38,572	9,67,140	38,05,712	19,30,780	2,11,000	21,41,780	5,29,365	14,28,716	41,71,081	2,11,540	2,51,000	4,62,540	4,91,000	2,11,540	1,54,000	3,65,540	22,56,620	2,11,540	1,54,000	3,65,540	26,22,160
N. Minor Establishments & Contingencies		14,71,716	14,71,716	15,84,000		15,84,000		7,35,858	7,35,858		15,84,000		15,84,000	38,91,574		1,15,000	1,15,000	15,84,000		15,84,000	16,99,000	55,90,574
Grand Total		24,38,856	52,77,428	35,14,780	2,11,000	37,25,780	5,29,365	21,64,574	49,06,939	2,11,540	18,35,000	20,46,540	20,75,000	2,11,540	16,69,716	18,81,256	39,27,196	2,11,540	16,69,716	18,81,256	82,12,734

* Viz. 1/3 to remain above the whole expenditure in Municipal Committees for roads, this is the basis of C. D. Officers.

† To this sum is added Rs. 8,00,000, the amount of Government loan for the Railway.

‡ The details of the Public Works Department in Oudh.

REPORT

OF

PROCEEDINGS

IN THE

PUBLIC WORKS DEPARTMENT,

DURING THE

Official Year 1860-61.

REPORT

OF PROCEEDINGS

IN THE

PUBLIC WORKS DEPARTMENT,

DURING THE OFFICIAL YEAR 1860-61.

FINANCIAL AND ACCOUNTS.

The accompanying Statement presents in a Tabular form the expenditure of the Public Works Department under the several Local Governments for the year 1860-61, as sanctioned by the Government of India, compared with the area, population, and revenue of the respective Presidencies and Provinces.

Budget sanction for 1860-61. Appendix A.

The whole estimated expenditure chargeable to the British Government fell little short of four millions sterling, viz.:—

Chargeable to Imperial Funds.

Disbursed in the Public Works Department...	£3,343,895
Ditto ditto Home Department, for Electric Telegraph charges	" 187,000
Government outlay for Railway control and purchase of land	" 162,389
Chargeable to Local Funds	" 223,900
Total British Public Works Expenditure ...	£3,917,184

Besides this there was an estimated foreign expenditure in Mysore and the Hyderabad Assigned Districts, chargeable to those Provinces, but disbursed by the Public Works Department, amounting to £107,519. Thus the total Public Works Expenditure in India, under the control of the British Government, during the year 1860-61, was

[P. W. Dept.] estimated at £4,024,703. The outlay in the Public Works Department in Pounds Sterling is thus classified :—

	New Works.	Percentage of total outlay.	Repairs.	Percentage of total outlay.	Total.	Percentage of total outlay.
	£	£	£	£	£	£
Military Buildings	643,854	18	130,575	4	774,429	22
Civil "	257,506	8	87,972	3	345,478	11
Agricultural Works	233,661	7	352,660	10	586,321	17
Communications	319,627	9	321,279	9	640,906	18
Miscellaneous Public Works	91,593	3	24,001	1	115,594	4
	1,546,241	45	916,487	27	2,462,728	72
Reserved for unforeseen requirements and petty works					307,466	9
Establishment Charges					681,220	19
			Grand Total ...		3,451,414	100

Of this total £3,343,895 is British expenditure, and this smaller sum is the total referred to in the following remarks.

Including the sum set down for unforeseen requirements and petty works, the expenditure on new works is 54 per cent. of the whole; 27 per cent. is for repairs, and 19 per cent. for supervising Establishments, consisting of Engineers and their subordinates, with the Offices for Correspondence, Drawing, Estimating, Accounts and Audit.

The expenditure on new Military Buildings is 19 per cent. of the whole, and forms a charge of £1-16-10 per cent. on the whole revenue of the country. It ranges from a minimum of 8*s.* 4*d.* per cent. in Bengal to a maximum of 28½ per cent. in the Straits. In Madras it is only 17*s.* 10½*d.*, in Pegu £6-4, and in Oudh £16-5.

The outlay on works of public improvement bears exactly the same ratio to the whole revenue of the country as Military works.

Speaking roughly, it may be said that Military works, works of public improvements, and Establishments, absorb each one-fifth of the whole expenditure, repairs one-fourth, reserved for unforeseen contingencies one-tenth, civil buildings one-twentieth.

The whole outlay of every kind in the Public Works Department is £3-11-6 per square mile, and about 6 pence (½ annas) a head of the population, and is a charge on the Revenues of 9½ per cent. [*P. W. Dept.*]

The allotments to the several Governments were—

		Per cent. of its Revenue.	Per square mile.	Per Head.
			£ s. d.	£ s. d.
To Madras	62 lakhs.	10	4 10 7	0 0 6
" Bombay	50½ "	8·2	3 11 11	0 0 10
" Bengal	51½ "	4·9	2 0 8	0 0 3
" N. W. P.	61 "	9·2	5 13 0	0 0 5
" Punjab	51 "	16	5 6 8	0 0 8
" Oudh...	25 "	20·9	10 0 0	0 0 9
" Nagpoor	6 "	14·7	0 15 8	0 0 3
" Pegu	12¾ "	28	3 18 7	0 2 10
" T. and M. Provinces	2¼ "	15	0 11 10	0 1 5
" Straits	6¾ "	51·5	43 3 1	0 6 9
" Hyderabad (British Charges)	5½ "			
" Coorg	¼ "	7·1	0 17 0	0 0 3

On the reverse of the Comparative Table is a list of the most important works on which expenditure was sanctioned, with the amounts it was intended to expend on each during the year.

The Authorities on which the area, revenue, and population of each Government or Province are stated, will be found explained in a note at foot of the Table.

Formation of a Department for Public Works Accounts in India.

The subject of creating a distinct Department for the audit and control of Public Works Accounts was referred to in para. 31 of the Report for the past official year. It is proposed now to notice very briefly some of the material points in connection with this important matter, and to state what steps have since been taken towards carrying out the object.

The original intention was to form a separate Department for Public Works Accounts under the Government of India, with a chief inspecting and controlling officer attached to the Public Works Secretariat to act in the capacity of an Under Secretary with special charge of the Account Branch of the Department, and to have under his orders the Controllers in charge of the Public Works Accounts and Audit of each Local Government. These Controllers, it was proposed, should take the powers and duties of the Chief Engineers in matters of account and audit, relieving the latter from this branch of their duty, and were, with their subordinates in the Account Offices,

[*P. W. Dept.*] to be classed in grades in the same manner as the Officers of the Public Works Department proper.

Some doubts were, however, raised as to the advisability of the further centralization involved in the intention to attach the Controller General to the Public Works Secretariat of the Government of India, and for this and other reasons it was eventually determined to await the arrival of the Officers from Madras and Bombay, who had been invited to discuss the new system of accounts with a view to its introduction in those Presidencies. Some delay occurred in the arrival of these Officers, and the matter remained in abeyance till 30th July 1860, when the late Mr. Wilson met the Budget Committee and the then Officiating Secretary in this Department (Captain C. H. Dickens), to discuss the subject in connexion with the general system of Audit and Accounts about to be established for the Empire.

The principles then settled were the following :—

That the Auditors and Controllers of Public Works Accounts should be established under all Local Governments, but under the name of Controllers and Examiners, and that they should be under the orders of the Chief Engineers instead of being independent Auditors.

That the Accounts of these Examiners should follow the same course as all other Civil Accounts, and should undergo "concurrent audit" by the Civil Auditor of the Local Government. They would arrive in due course under the general audit of the Audit Department of the Government of India.

But to preserve uniformity of system, and to afford the Public Works Office of the Government of India a proper control over the financial operations of the Department, that an Inspector of Public Works Accounts should be appointed, who would be the Financial Officer of the Public Works Department of the Supreme Government, and to whom the other Local Civil Auditors and the Auditor General might refer for an opinion in all matters in which technical questions might arise in the audit of the Examiners' Accounts which these Officers may need assistance to dispose of. The Inspector would, as the name imports, also inspect the Local Offices; he would receive Returns from them and keep up the Financial records of the Public Works Office of the Government of India.

Besides these and other important duties to be performed by the Inspector, a very difficult part of his duties would be to establish a system for the audit and examination of Railway Accounts.

The above arrangement, it will be seen, is essentially the same as that originally proposed, except that the Examiners are to work under the Local Governments and Chief Engineers, instead of being under the Government of India, while the appointment of the Inspector and the establishment of a General Audit Department affords the necessary control to the Supreme Government.

It was finally resolved by the Government of India to act upon the above principles, [*P. W. Dept.*] and the arrangements have since been carried out.

Controllers and Examiners will receive salaries and departmental rank corresponding with the Officers of the Engineer Establishment, and the principal subordinate Accountants in their Offices will likewise be classed in rank and salary with the Officers of the Upper Subordinate Establishment of the Public Works Department.

Working of the Offices of Account. Appendix B.

The accompanying Statement shows the working of the several Offices of Controllers and Examiners of Public Works Accounts, and the state of the Accounts as they stood in February 1861.

Practice of anticipating Budget allotments.

The confirmation of the Government of India having on more than one occasion been requested to certain sanctions made by Local Governments in excess of the limit of Public Works Expenditure for 1859-60 as anticipations of the outlay assigned for 1860-61, it was found necessary to point out that if the system of anticipating the succeeding year's allotment were permitted, besides defeating the main object of these specific assignments, which is to limit the demand upon the public exchequer within the year, it would make precision in financial arrangements for the Public Works Department impossible, and the annual allotments would be rendered delusive.

Other evils resulting from the system were noticed at the same time, and it was remarked that while all ordinary exigencies which might arise during the year should be met out of the allowance made in the Budget for unforeseen expenditure, or by restricting outlay on less urgent works, the Government of India would be prepared to consider any application in relation to special and unforeseen emergencies whenever their importance would justify it.

Enhanced rates in Estimates and Bills.

The attention of Government having been drawn to a practice, generally prevalent, of bringing forward rates for the sanction of the Supreme Government, both in Estimates and Bills, in excess of those which had been previously current, merely supported by a *general* statement of the necessity of the increased charge, a Circular was issued to the Local Governments and Administrations, intimating that in such cases enhanced rates should always be explained by comparative and definite figured statements of the cost of 100 cubic or superficial feet of work, as the case may be.

Budget Estimates in territories anomalously situated.

Some portions of territory in Central India were peculiarly situated as regarded the operations of this Department.

Ajmere, for example, was under the Civil Administration of the North-Western Provinces, whilst the Garrisons of Rajpootana were furnished by the Bombay Army, and the Military buildings were under the Bombay Public Works Department.

[*P. W. Dept.*] Nimar was under the Governor General's Agent for Central India. Its Civil public works were not of much importance, but they did not appear to have been attached to any Executive Division.

The Government of Bombay objected to deal with estimates for Civil works in such territories over the administration of which it had no control, and regarding the circumstances of which it had no official knowledge. It was urged that in reducing the demands of the Bombay Territories to the limits of the Budget assignment, much balancing of claims and large eliminations were necessary, and that demands from territories not under the administration of that Government could not be fairly dealt with under such a system.

His Excellency the Governor General admitted the reasonableness of this objection, as regarded works required for purposes of Civil administration over which the Bombay Government had no control.

The territories so situated are however of very limited extent, and the annual sum required will not be very large, and to meet it a special reserve over and above the Budgets of the Local Governments will hereafter be set aside by the Government of India. A statement of expected requirements will be submitted annually by the Officers of those territories, approved by the regular Heads of their Administration, e. g., Ajmere through the Government North-Western Provinces, and Nimar through the Governor General's Agent.

Works connected with Residencies in foreign States will be provided for in the same way.

No objection was raised by the Bombay Government to dealing in their Budget with proposals for Military works or Imperial lines of communication.

Such Civil works as are contemplated above are generally of a character that can be executed without the assistance of Officers of the Department. Where they are of a more important character, they can always be placed under the charge of the nearest Executive Engineer, under whatever Government he might be. But this of itself will not make the work chargeable to the Budget of that Government.

The Governments of the North-Western Provinces and Bombay have been advised to the above effect, and the former Government has been told to include a statement of the requirements of the description indicated, of the districts in Rajpootana under that Government, in its annual Budgets for the future.

Power of Director General of Post Offices in India to sanction works within the limits assigned by the P. W. Code.

The consideration of this subject arose out of a question raised by the Government of Bombay.

The Executive Engineer, Nassick District, having made preparations for commencing a Post Office at Egutpoora on an estimate sanctioned by the Director General of Post Offices in India, it was represented by the Government of Bombay that the work, if sanctioned, would have to be debited to the Public Works Budget of 1860-61, and it appeared anomalous that expenditure incurred

under directions from the Director General, over whom the Bombay Government had no [*P. W. Dept.*] control, should be debited against the amount allowed on the Budget of that Presidency.

The matter was referred to Mr. Riddell, the Director General of Post Offices, with the remark that the best remedy would probably be that the Director General, whilst taking care that every thing foreseen should be communicated to the Local Governments in time for entry in their Budgets, should also name a moderate sum to cover such contingencies, which would also form an item in the Budget.

In his reply the Director General pointed out that under existing rules all estimates for works connected with the Post Office, after having been examined and approved by him, were on his requisition entered in the Budget of the Government or Administration in which the works might be situated, but that after being sanctioned by the Supreme Government, it rested with the Local Government to execute them or not, no reference being made to him on this point. A work really very urgently required might therefore, without his knowledge or the knowledge of an Officer of the Department, be indefinitely postponed, to the serious inconvenience of the Department.

As the Post Office is a separate Department, debited with its own expenditure, and not subordinate to the Local Government, the Director General submitted that the Head of the Department should have a voice in the selection of the works which from financial pressure it might be necessary to postpone.

He likewise proposed that it should be ruled that when any sum has been sanctioned by the Government of India for any work connected with the Post Office, it shall not be competent to the Local Government to suspend the execution of the work, and expend the amount sanctioned for it upon other works not connected with the Post Office Department.

The Government of India was not prepared to go the length suggested by the Director General, but the Local Governments and Administrations were directed, in communication with him, to include in their Budgets a certain sum for his unforeseen requirements. The sum thus set aside will not be large.

Limit to be fixed to the total year's expenditure under Local Military sanctions at each Station.

Complaints were made in several Provinces of the obstruction to the exercise of the powers of sanction of small works conferred by the Public Works Code on Officers in Military command. It is obvious, however, that when the total limit of expenditure under any Government is so strictly and absolutely fixed as it now is, the items which make up that total must also be under strict limits, and the best way to meet the difficulty appeared to be to fix a provisional limit to the total year's expenditure under Local Military sanctions at each Station. Commanding Officers will then be made aware that if they draw upon their powers of sanction too rapidly, those powers will become exhausted before the end of the year. This course has been suggested for the consideration of the Local Governments and Administrations.

[*P. W. Dept.*] DEPARTMENTAL MANAGEMENT AND DETAILS.

Travelling allowances to young Engineer Officers on first joining the P. W. Dept.

It has been decided to grant travelling allowance to young Officers of Engineers when summoned from the Sappers to join the Public Works Department. The allowance could not be claimed under the Public Works Code, for the obvious reason that Officers cannot claim to benefit by the rules of a Department until they have actually joined it. But the case of these Officers was peculiar and needed to be specially met. They are not and ought not to be asked whether they will join the Public Works Department, for it is a part of their calling, and not optional, as with Officers of other Arms and with Non-Military candidates, added to which, they are called to the Department much earlier than other Military Officers are likely to be.

Departmental pay of Officers or Subordinates newly appointed to the Public Works Department, when to begin.

On a reference from the Chief Commissioner of Oudh, enquiring whether, with reference to Chapter XV., Section 2, para. 1 of the Public Works Code, Officers or Subordinates newly appointed to the Public Works Department are entitled to receive "Departmental" pay from the date they report themselves to the Chief Engineer, or from the date of their joining at the Station to which they may be posted, it was ruled that when an Officer or Subordinate is appointed to the Public Works Department at any particular Station, he will not be entitled to departmental pay till he joins that Station, but when simply appointed to the Public Works Department in any particular Province, he will be entitled to departmental pay from the day he reports his arrival to the Chief of the Department in that Province.

Promotion of Native Probationary Assistant Engineers.

The Chief Engineer, Bengal, in reporting the case of a Native Probationary Assistant Engineer attached to the Garrison Engineer's Department, Fort William, who had passed an examination for advancement in the Public Works Department, observed that if he were promoted he would in 12 months have risen from Rs. 100 to Rs. 250 per mensem, besides travelling allowances at Rs. 4 a day. He believed that Government could not have intended that Natives who are boys in age and of no experience in their profession should so rapidly rise to the receipt of allowances which are higher than those of a Sub-Engineer, 3rd Class, and the ultimate aim and hope, after many years' service, of Europeans who are of 20 times their practical value in the Department. The adoption of this course would, he considered, be detrimental to the best interests of the Department, and discouraging in the last degree to the senior classes, especially of the Upper Subordinate Establishment, whose ranks contain men who have grown old and grey with fatigue and exposure in the service of Government, and whose practical value to the Department of Public Works far exceeds that of the youths in question. The Chief Engineer therefore recommended that the promotion in such cases should be deferred, until, by transfer to different Divisions of the Department, they had acquired a practical knowledge of the various kinds of work which constitute part of their profession.

It was observed in reply that the Chief Engineer would be justified, in the case of any Probationary Assistant Engineer, whether European or Native, in recommending, in the face of any Committee Report, a further period of probation before promotion, if he considered the individual unfit for promotion. In the instance before the Government, however, there was no allusion to want of fitness in the individual, but the recommendation was based on a general view of the inefficiency of Natives as compared with Europeans. The Government of India was not prepared to admit this ground, and considered that Natives should be allowed to compete fairly with Europeans for promotion in the Department, and not be allowed to fall into an inferior position, except in consequence of proved inferiority in conduct or qualifications. Each case should be dealt with on its own merits, quite irrespective of any general view as to the worth of the class to which the individual belonged. [*P. W. Dept.*]

It might possibly have been meant by the Chief Engineer that the examination, though it gives a fair test of fitness in the case of Europeans, does not suffice to expose the want of energy, self-reliance, and weight of character, which is so often the defect of Natives ; but this subject was fully considered by the Code Committee, and the principle adopted was, that there should be no distinction of race or creed, and that the prizes of the Department should be open to all equally, even to the extent of giving the Natives of this country, whose expenses are fewer, the same allowances as Europeans, and thus giving them some advantage irrespective of personal qualification.

This rule should be acted upon. To do otherwise would be a breach of faith with the Native community. But at the same time it is obviously desirable that those faults to which Natives are prone should be carefully guarded against and strictly punished. The standard of conduct in the Department must not be lowered ; but the Native community should understand that they can only expect to benefit by the opportunity afforded of competing with Europeans when they raise themselves to the same standard, not only of intellectual acquirements, but of practical energy and moral power.

The rules are however admitted to be somewhat deficient in tests of moral qualities. This will be attended to in revising the Code or in preparing the next Supplement, as the case may be. But it was thought that in the meantime some remedy might be afforded by requiring as a preliminary to the examination, a report from the Officer under whom the Probationer has served, as to his practical energy and powers of command and management of those under his authority, and the Local Government have been asked to render assistance in the amendment of the rules to meet the practical difficulty of dealing with cases in which the intellectual tests having been complied with, the persons may still be unfit for promotion owing to want of moral qualification.

Proposition for limiting the travelling allowances of Native Probationary Assistant Engineers to Rs. 50 per mensem.

A short time before this a proposition emanating from Captain Beadle, (then Superintending Engineer, 6th Circle,) and supported by Major Chesney, the Officiating Controller and Auditor of Public Works Accounts for limiting the travelling allow-

[*P. W. Dept.*] ances of Native Probationary Assistant Engineers to Rs. 50 per mensem, was received in this Office and negatived.

Under existing rules *all* Assistant Engineers are entitled, when travelling on public duty, to Rs. 4 per diem for any distance between 5 and 20 miles beyond Head Quarters, and to 8 annas per mile for longer distances. Captain Beadle had so much difficulty in reconciling himself to the travelling bills drawn by the Native Probationary Assistant Engineers, that he drew attention to the fact that the travelling allowance was out of proportion to their salaries of Rs. 100 per mensem while on probation.

Major Chesney considered that travelling allowance should cover the expenses of Officers travelling on duty, but should not be a source of profit, and he stated that the present allowance was altogether beyond the wants of Native youths, whose bills in some instances exceeded their salaries.

The persons referred to are young Natives who, having received a liberal education and studied at the Civil Engineering Colleges, have passed the highest standard fixed and have been appointed to the Public Works Department as Probationary Assistant Engineers. It may be quite true that from their frugal habits and capability of resisting the effects of the climate, they can live and travel cheaper than the European or Eurasian, but this is hardly a sufficient reason for breaking through an established principle of the Department, which is open to all, and in which all classes of Officers and Subordinates are treated alike according to grade, without distinction of race or colour. To change a fixed rule upon a minor point would form a precedent which might gradually lead hereafter to similar differences being created on other points between Europeans and Natives, and any distinctions of this kind would naturally be felt by the Native as a tacit mark of inferiority in position, and might act prejudicially by discouraging his hopes of being really allowed to compete on even terms with the European.

Besides, the main object of a travelling allowance is to pay the expenses of Officers so as to encourage their travelling in their districts as much as possible, and any measure which would tend to repress their activity in this respect, would be injudicious, and would in the end prove the reverse of economical. The condition of roads, canals, embankments, and buildings entirely depends upon the degree of supervision exercised by the Engineers, and the more the latter are on the move throughout their charges, the more they keep the Overseers and workmen on the alert, and the more efficient and less costly in the end will be the maintenance of these public works.

There may of course arise some instances of abuse of this privilege, but these can be easily discovered, and the men punished. The Superintending Engineer has power to check any irregularities in this respect, and when he may find young Assistant Engineers overstepping reasonable bounds, it rests with him to fix a limit to their journeys, though at the same time he should rather seek to promote habits of energy and activity in young Native Probationary Assistant Engineers, than endeavour to repress them. As the Superintending Engineer can therefore practically prevent an undue advantage being taken of the existing rules, there was no necessity for introducing the change proposed, which

would infringe the broad principle of uniformity of treatment for all the Officers who compose any particular grade of the Public Works Department. [*P. W. Dept.*]

Local rank with increase of salary to Officers and Subordinates in the Public Works Department in Pegu and the Tenasserim and Martaban Provinces.

The Commissioner of Pegu recommended that Officers and Subordinates in the Public Works Department in the Pegu and Tenasserim and Martaban Provinces, whose services it might be deemed desirable to retain there, should be allowed a local step of rank with the corresponding increase of salary.

The ground on which this recommendation was based was the great expense of living in Burmah as compared with other Provinces. The Government had already recognized the validity of this consideration. Subordinates, owing to the unpopularity of the service, had been ordered to be relieved every three years, and those who would in other Provinces be appointed Probationary Assistant Overseers were granted in Burmah the rank of *Temporary* Assistant Overseer, drawing as such Rs. 20 more pay than they would be entitled to as Probationers.

These arrangements had not been found to suffice; applications to return to India were frequent, as were also instances of misconduct and removal, so that the Chief Engineer estimated the supply of Assistant Overseers which was necessary for the Burmese Provinces, at no less than one a month.

Moreover, on occasions of relief, the Chief Engineer found that the exchange was always against him. The Chief Engineers of other Provinces are naturally unwilling to part with their best men, and Government loses the experience and knowledge of the language and people acquired by those who are relieved. The expense incurred for passage money and travelling allowance owing to these constant removals was also very considerable. Relief must take place from different Local Governments in turn, and a Subordinate might be transferred from one extremity of India to the other.

It was to remedy these evils that the proposal above noticed was made by the Commissioner of the Province.

The Government recognized the expediency of placing the members of the Public Works Department in Burmah on the same footing as regards emolument, as those in other Provinces. But it was considered preferable to grant the pay of the higher rank without the denomination of the rank. The compulsory service for three years was still insisted on, the increase being granted on the authority of the Local Administration, but only after trial and approval of services, while the power of summarily withdrawing it would also vest in the Local Administration, if not satisfied that its continuance was fairly earned. These orders applied to the Subordinate Department only; in the case of members of the Engineer Branch it was not thought that any such general rule was required; cases of promotion might continue to be decided on their respective merits.

[*P. W. Dept.*] With a view to establish a more uniform system, as well as to save correspondence in cases of appeals against charges made on account of Barrack damages, the following regulations laid down by His Excellency the Commander-in-Chief were circulated for guidance of Local Governments and Administrations :—

Charges on account of Barrack damages.

I. Upon the General or other Officer in command receiving an appeal in writing, he will, unless he be at once of opinion that the charge should be borne by the Corps appealing, order a Court of Inquiry to assemble on the spot, the President of which should, if possible, be a Field Officer, and one of the Members an Officer of Engineers, or (where readily available) a Barrack Master of a Barrack District other than that in which the damage was assessed. Where practicable, neither the President nor Members should be detailed from the Corps making the appeal.

II. Such Court will take evidence in support of the appeal, as well as on the part of the Barrack Department concerned. They will also, in the case of damage to buildings, examine such Member or Members of the Engineer Department as may be named by the Superintending Engineer as most competent to afford information as to the reasonableness of the *amounts* charged.

III. They will record their opinion upon the charges made, and in the event of their recommending any remission thereof, will state fully their reasons for such recommendation.

IV. Should the Officer convening the Court be of opinion, after a perusal of their proceedings, that the charges made should be borne by the Corps appealing, he will issue instructions accordingly ; but should he consider that any remission should be made, he will forward the proceedings of the Court, with his remarks thereon, together with the original appeal, to the Quarter Master General, for the consideration of the Commander-in-Chief.

Sanitary arrangements in Cantonments.

Several complaints having been made by the Local Medical and Military Authorities as to the defective sanitary arrangements at the Cantonment of Dum-Dum, orders were issued for remedying the defects complained of, and for rendering the sanitary arrangements more satisfactory. A Circular was also issued to the Local Governments and Administrations, directing that inspecting Medical Officers when on the spot should communicate freely with the Officers of the Public Works Department before sending up elaborate Reports to Government. Departmenal Officers were also requested to be particular on such occasions to give the fullest possible information as to why every thing cannot be done which Medical Officers may desire, whenever such may be the case.

Local Authorities to be always consulted as to sites for Military buildings.

The Commander-in-Chief having brought to notice that frequent applications had been submitted to him, suggesting changes and alterations in buildings on account of their not being erected with due regard to the direction of the prevailing winds, a Circular was issued, calling

the attention of the Officers of the Department to the regulations on the subject, and directing that in addition to the existing rules, it be considered a standing order for the future that the Local Authorities should always be consulted as to the convenience of a site. [*P. W. Dept.*]

Economization of labour in punkah-pulling.

The attention of Government in this Department has frequently been called to the subject of punkahs in Barracks, and to the very serious expense to the State of punkah-pulling for European Troops. More than one scheme for economizing labour by mechanical appliances have been tried; Committees had been assembled throughout the Bengal Presidency to consider what rates should be paid by Government for punkah-pulling, but the rates recommended were exceedingly various and generally enormous, owing in a great measure to the different methods of hanging and arranging the punkahs. The Local Governments and Administrations have now been directed to call upon all Executive Engineers to take the subject into their careful consideration, and to effect at once such changes in hanging and arrangement as would obviously lead to economization of labour, and reports have been called for of the result of the measures taken under these instructions.

A design by Lieutenant Colonel Hogge, which promises to economize cooly labour considerably, is at present under trial at Meerut.

Pay and allowances of Military Officers on Civil employ.

The Officiating Civil Auditor raised a question as to whether the ruling in the Financial Department, that Military Officers in Civil employ when transferred from one appointment to another shall be restricted to their Regimental pay and allowances during the period of transit, was intended to affect Officers of the Public Works Department.

It was stated in reply that the pay of Officers in the Public Works Department was not in any way dependent on their *appointments*, but on their *grades*, in which no break or interruption occurs on the occasion of transfer. Consequently Article 4 of Section 32 of the Military Pay Code for 1849 was not applicable to the Public Works Department. To render it so would make an invidious distinction in favour of the Uncovenanted branch of the Department, and tie the hands of Government in making transfers, unattended with increase of salary to the parties concerned, but required by the public interests.

Moreover, the principle in question, that the salary and position of an Officer in the Gradation List of the Public Works Department depends upon his grade, and not on his local appointment, runs through the Code of the Department affecting many points besides the one raised, and was established by Government as an accepted principle in sanctioning the Code. To upset this principle would be a revolution in the organization of the Department, which should not be liable to such revolutions on occasional or fortuitous suggestions.

[*P. W. Dept.*] In connexion with several cases lately brought to the notice of Government in which Courts of Enquiry into the conduct of Military Subordinates of the Department had been convened on trivial occasions thereby occasioning the loss of much valuable time, the rules of the Code which admit of recourse to such Courts were brought under consideration.

Courts of Enquiry in cases of misconduct, &c., on the part of Subordinates of the P. W. Dept.

As these rules* stood, it was open for the Executive Engineer in the case of Military Subordinates to demand a Military Court of Enquiry, or in case of being distant from a Military Station, the Chief Engineer could on his report direct the assembly of a Departmental Court, or order the accused and the witnesses to a Military Station for investigation of the case by a Military Court of Enquiry.

* P. W. Code, XVI., III., 11—13.

Non-Military Subordinates were to be similarly dealt with in cases of serious misconduct, except that the Courts of Enquiry were to be always departmental.

P. W. Code, XVII., 6.

It had been found in practice that these rules could not be carried out, and they had been frequently departed from. The Government had often requested the remand of Soldiers and had dismissed Uncovenanted Subordinates without a Court of Enquiry. Indeed, many cases *could not* be satisfactorily dealt with by such Courts.

Nor was a Military Court in the majority of cases, nor even a Departmental Court in many, a necessary, convenient, or useful engine in administering the discipline of the Department, though there are cases in which each would be appropriate.

It was accordingly directed that Public Works Code, XVI., III., 11, should in future run thus:—

"11.—Whenever an Executive Engineer may think that a Non-commissioned Officer or Soldier should be removed for misconduct or incompetence, he will apply to the Superintending Engineer. The latter, after the fullest investigation in his power, will submit the evidence, with his own opinion, and (in cases of alleged misconduct) the defence of the accused to the Chief Engineer, the latter, if he sees cause for proceeding with the case, will take the order of the Local Government, which will, according to its judgment, decide on the documents before it, or cause further investigation by a special agency, or apply to the Military Authorities for a Court Martial on the accused. For the special agency the Local Government may either appoint a Departmental Court (consisting of three Officers of the Engineer Branch), or associate a Civil Officer with the Superintending Engineer."

His Excellency the Commander-in-Chief has expressed his desire that in all practicable cases, Soldiers instead of being simply remanded for misconduct should be brought to trial. This of course has no application to cases of mere incompetence.

In para. 12, for " the full proceedings of a Court of Enquiry, including the Court's opinion of the case," the following has been substituted : " or of such further investigation as is provided for in the preceding paragraph, including the opinions of the Officers appointed to conduct it." [*P. W. Dept.*]

In Code XVII., 6, regarding the removal of Uncovenanted Subordinates, instead of "except that the Courts of Enquiry will be Departmental," has been substituted " except that they are not subject to Courts Martial."

Responsibility of Barrack-Masters.

The rule in para. 14, page 28 of Supplement to the Public Works Code, provides that the responsibility for work done on the requisition of the Barrack Department is to rest with the Barrack Master, who has the immediate supervision of the work, the Public Works Department supplying the necessary labour and material, and making the disbursements, and the Barrack Department furnishing the Executive Engineer at the end of each month with a Completion Certificate countersigned by the Regimental Commanding Officer, to serve as a voucher for the disbursements.

The Bengal Government suggested that some modification of the rule should be made to meet cases in which the Barrack Department might be unable to obtain the Completion Report duly signed, owing to the labour and material supplied to him not being efficiently applied to the work, and proposed to substitute in lieu of the Completion Certificate the Barrack Master's receipt for labour and materials supplied, as the voucher for the Executive Engineer, leaving the Barrack Department to clear itself by the Completion Certificate. This was sanctioned, with intimation that the Superintending Engineer of the Circle should bring every such case under the notice of the Officer in charge of the Quarter Master General's Department at Divisional Head Quarters.

Dissolution of the Fort William Special Committee.

The objects for which the Fort William Special Committee was appointed, having been for the most part attained, and changes having lately been made in the internal administration of Fort William, assimilating it to that of other Military Stations in Bengal, the Committee has been dissolved; the subjects remaining to be considered were to be dealt with, under ordinary rules, by the Public Works Department of the Government of Bengal.

The services of the Members of the Committee were duly acknowledged by the Government of India.

STANDARD PLANS.

Alterations in the Standard Block Plan of Artillery Barracks and Lines for Stations in the plains.

At the suggestion of Colonel Sir G. R. Barker, Commanding Royal Artillery in Bengal, the following alteration has been sanctioned in the Block Plan of Artillery Barracks and Lines for Stations in the plains :—

The Harness Rooms and Artificers' Shops are now placed at the end of the stables nearest to the men's Barracks, instead of at the farthest end, and the Forge and the Shoeing-shed are in a separate building, instead of under the same roof with one of the Harness Rooms, and are situated at the end of the sick stable nearest the Barracks.

Levy of the one per cent. duties on Incomes in India for local purposes.

This tax was imposed in order to supply the Government with resources for the advancement of material improvements, the neglect of which is calculated ultimately to cause a deterioration in the country and its revenues, and the suspension of which entails immediate loss and inconvenience.

Appendix C.

In support of this opinion a Return is appended of projects for Public Works retarded or postponed for want of funds. Although the number and variety of the works entered in the Statements may appear very great, it should be borne in mind that no petty operations have been included, but only works of a certain magnitude and importance, costing each a lakh of Rupees or £10,000, and upwards.

Nor are these works mere projects, which, however intrinsically desirable, cannot be undertaken for an indefinite period, but they are works of a certain degree of urgency, for which Plans and Estimates are more or less complete, on many of which considerable sums have already been expended, and for the carrying on of which the Local Governments recommended that specific sums should be appropriated in the Budgets.

The general results of the Return may be thus stated—

	Rs.	Rs.
Estimated cost of works postponed or retarded ...		7,83,11,149
Deduct work done in part of the same		2,54,50,409
Balance for which funds are required		5,28,60,740
Add for works not included in the Return—		
* Wet Docks for Calcutta	1,00,00,000	
† Cuttack Irrigation and Navigation, as per Colonel Cotton's Estimate	1,30,00,000	
Some project less expensive than Colonel Cotton's for a Canal from Rajmahal to Calcutta...	50,00,000	
Public Offices in Calcutta	25,00,000	
		3,05,00,000
Total ...		8,33,60,740

The total estimated cost of all the works amounts therefore to Rs. 10,88,11,149 or £10,881,115, that is, nearly 11 millions sterling. Of this large aggregate Rs. 2,54,50,409

* Recent changes in the constitution and organization of the Bengal, Marine, and the Ganges Steam Flotilla, will probably obviate the necessity for the construction of these expensive Docks.

† A private Company has offered to undertake these works, vide page 32 of this Report.

or £2,545,040, that is, 2½ millions sterling, have been already expended; so that there remains Rs. 8,33,60,740 or £8,336,074, that is, 8⅓ millions sterling, to be expended on these necessary works, for which expenditure funds are not at present available. [*P. W. Dept.*]

The projects are upwards of a hundred in number. Of these 25 relate to Irrigation and Navigation; 45 to Communications, Roads, Bridges and Tunnels; 4 to the Judicial Department; 2 to the Educational, and 3 to Sewerage, Drainage and Water Supply. There are various projects of a miscellaneous character; also 16 Military and 2 Naval or Marine projects. In all there are only 18 projects relating to the defence of the country out of a total of 106 projects, leaving 88 projects of a Civil character, relating to internal improvement, the execution of which must lead to an augmentation of natural resources, and the postponement of which entails loss, either direct or indirect.

All and each of these works, as already stated, must be considered of more or less immediate importance; but the number is so great, that only a few of the most important can be selected for special mention in this Report.

In the Provinces under the Lieutenant Governor of Bengal, a very large amount is required for roads. About nine and a half lakhs are needed for the completion of the Great Trunk Road from Calcutta to Benares. The road-way itself is for the most part complete, but many bridges remain to be constructed, and the want of them seriously retards communication during the rainy season. Considering the Military and Political importance of this road, which is an integral section of the greatest trunk line in India; considering also the unavoidable delay which has already occurred in its construction; the expediency cannot be doubted, of incurring the necessary outlay for its final completion.

Then seven and a half lakhs are required for the construction of branch roads, which are to be subsidiary to the Railways now in progress, and which are to feed those great works by facilitating the passage of traffic and passengers from the interior to points where Railway communication will be available. The great importance of these feeders to the public, to the Government and to shareholders, is so obvious that the question of the necessity for their early construction need not be discussed.

Besides the project for the construction of works of irrigation and navigation in Orissa, which a private Company recently offered to undertake without guarantee, and the project for extended canal navigation to connect the Ganges with Calcutta, which is necessary to aid the growth of the traffic of the lower Gangetic Valley, the increase of which is among the most gratifying circumstances of the time, there is also a valuable project for irrigation from the River Soane in the Shahabad District of the Behar Province, designed by Lieutenant Colonel C. H. Dickens. No specific sum has yet been set down for this; but, without doubt, the execution of the project would vastly augment the resources of that district.

In the North-Western Provinces, 29 lakhs are required for the completion of the Ganges Canal with its branches and distributing channels. It would be difficult to point

[*P. W. Dept.*] to an outlay which more immediately concerns the interests of the Government and of the people than this. The canal has been constructed at an enormous cost; its utility will be almost entirely for irrigation rather than for navigation; but while the distributing channels, which are to spread like a net work over the surface of the country, and which are intended to carry the fertilizing water to the fields and villages, are incomplete, the people cannot derive all the advantages which the canal is calculated to yield, nor will the Government receive a full return for the capital invested. Meanwhile the water diverted from the Ganges at so great a cost cannot be made full use of, and consequently the canal has not yet fulfilled the financial expectations that were formed.

Similarly in the Punjab, some 64 lakhs or more than half a Million Sterling are still wanted to complete the Baree Doab Canal, and equally strong reasons exist for this necessary outlay. Further, some outlay is needed to revise the levels of the Western Jumna Canals, for owing to percolation of the water, swamps are being formed and cultivation is suffering.

Considerable sums are urgently needed too for the completion of the Grand Trunk Road from Delhi to Peshawur. It is difficult to over-estimate the Military and Political importance of this line. It may suffice to remark that had not the Trunk Road in the Cis-Sutlej States been partially completed previously to 1857, the re-capture of Delhi in that eventful year would not have been possible.

In Oudh there are projects for several important roads. The expenditure for internal improvement in this Province has hitherto been very small. The roads are needed to connect the principal towns in that rich Province with each other, and with the marts in the adjoining districts of the North-Western Provinces; to subserve various Political and Military purposes, and to supplement the Railway communication now being provided for that part of India.

The improvement of the navigation of the Gogra has not been included in the return from Oudh. It would of course be most desirable to take this operation in hand for the benefit of the commerce of the rich districts through which it flows, should the state of the finances permit.

In the Nagpoor Province a system of roads is much required. The projects, though not complete, are in progress, and an outlay of several lakhs in this Province would doubtless be most beneficial. It is to be remembered that Berar is one of the principal Cotton Districts of India.

In British Burmah (Pegu) many public works are suspended for want of funds. Jails have to be built; Roads to be made; Dock Yards and Harbours to be provided; navigation to be improved; and in addition to these, there are Military Works of importance, relating to fortifications, and to the Departments of Ordnance and Commissariat, for which additional funds are required.

In the Madras Presidency large sums are needed for important works of irrigation, [*P. W. Dept.*]
navigation and communication, each one of which would add immediately to the resources of the people and of the State, but all of which are suspended from want of funds. Of these, four projects relate to works connected with the Lower Godavery, and five to works connected with the Krishna. Considering the happy results which have flowed from the operations on these most valuable rivers, the suspended projects are full of promise for the improvement and extension of cultivation, the elevation of the people, and the facilitating of trade. There are also two projects for Railway feeders.

But the most important of the works deferred for want of funds in the Madras Presidency, is the project for the navigation of the Upper Godavery. This is one of the most interesting works now under consideration in India. It will at once connect Berar and other Districts of Central India with the Eastern Coast, and will give an impulse to the production and export of cotton. Some funds have been allotted for this work, but the project is of far too great importance, both to India and to England, to be carried on in the dilatory manner inevitable in the present state of the finances, and the idea has latterly been entertained of resorting to private enterprise for its execution.

In the Bombay Presidency works on many roads of great commercial importance are also suspended; such as various lines to connect the Southern Mahratta Districts with districts of the Madras Presidency and Hyderabad; and roads in the districts of Ahmedabad, Surat, Ahmednuggur, Kandeish, Poona and Sattara. Improvements are also needed to the Docks at Bombay, and a Wet Dock is required.

In Sindh 20 lakhs per annum are required for various canals, &c.

Such briefly are the more valuable works which are suspended for want of funds. The several Local Governments consider that a million and half Sterling a year may, with advantage, be expended for two years. But it is very desirable that the expenditure on Public Works in India should be regular and continuous. If an extensive suspension of works should unfortunately occur, it would not be practicable to re-commence operations with a sudden impulse. Should this be attempted, inefficiency of Establishments and insufficiency of control will certainly result. Trained and skilled Establishments of all grades can only be obtained gradually; if once dispersed, they cannot easily be collected again. There are no such markets for materials, labour, or supervision as would furnish resources in the emergencies which would necessarily arise under such an intermittent system. Whenever public works have been suspended from financial pressure, the loss to Government in a variety of ways has always been very considerable. They cannot be retarded one year and advanced rapidly the next, without injury to the interests of Government. The only means therefore for carrying them on in an economical and satisfactory manner, is to provide a sufficiency of funds that may be continuously available.

The above review will show how very far the appropriations which the Government of India has been able to make for Public Works in 1860-61, fall short of the actual requirements of the country; and how urgent is the need of additional means to meet the important ends which force themselves on the notice of the State. If the postpone-

[*P. W. Dept.*] ment of the works above noticed, and others like them, should be prolonged, the progress of the country must of necessity be retarded, the revenues suffer, and the general administration be affected. Yet to provide for these works without raising additional taxes for the purpose was simply impossible, and it was under these circumstances that the Government accepted the necessity of imposing the one per cent. duty on incomes for public works. In India there are no Municipal bodies, no County Authorities, to raise and expend money for public works. All such arrangements devolve on the Government, and the limited local funds which do exist are collected by the Government and expended by its Officers. The Government alone is responsible for the material improvement of the country, and it must provide for internal development as well as for external defence. The one per cent. duty, though appropriated for this specific purpose of internal improvement, and in some cases intended to be vested in Local Committees, will be expended on works sanctioned by the Government, which works will not only confer local benefits, but will also be connected with general projects for the improvement of the country; they will facilitate and expedite the accomplishment of new works, which without such aid would have been left to be undertaken with Imperial funds, and those Imperial funds will be made more free for application to strictly national undertakings.

Provision of quarters for married Soldiers.

This question is one of much importance. The provision of quarters in Barrack ranges, according to the system now in vogue, for the whole of the married Soldiers of the Army in India, would be attended with very heavy expense. In some instances convenient and healthy accommodation has been provided for the married men of Corps at a comparatively trifling cost, under certain Regimental arrangements, and the Military Finance Department recommended the adoption of this plan wherever it might be found practicable; the Government aiding by advances or grants the funds raised from other sources.

Little was known on this side of India of the "Patcherry" system, the one alluded to above, and the Governments of Madras and Bombay, under which chiefly it has existed, have been asked for information as to its nature and capabilities, and the other Local Governments and Administrations have been requested to supply precise information as to the existing methods of accommodating married Soldiers in different places, and as to the number of married Soldiers who have still to be provided with quarters, looking (first) to the actually existing number, and (secondly) to the allowed maximum.

Radiation of heat from iron posts and stanchions of iron-framed Barracks.

Sir W. Mansfield, late Chief of the Staff, brought to the notice of Government that the iron posts and stanchions of the iron-framed Barracks in use at some Stations became excessively heated, and suggested as a remedy that they should be covered with wood. It appeared, however, from experiments made in Bengal and the Punjab, that all that was required to keep these Barracks as cool as ordinary buildings was to keep them closed during the day.

Cantonment of Bangalore.

The correspondence on this subject originated with the Madras Government, who proposed certain measures for the defence of the Cantonment. The opinion of the Commissioner of Mysore

was obtained on these proposals, and several points were settled in communication with him. The points on which the orders of the Government of India were asked were the following:— [*P. W. Dept.*]

Entrenchment round the new Dragoon Barracks.
The supply of water.
The position of the Arsenal.
Stables for the Dragoon Horses.

After obtaining the opinion of His Excellency the Commander-in-Chief on these points, the Government of India addressed the Madras Government to the effect that the enclosure of the Barracks by a continuous entrenchment of about one and a half mile in circumference, such as that proposed, was not approved of. The extent of the work to be defended, the want of flanking fire, and the obstruction to ventilation, and other inconveniences which must result from thus enclosing Barracks in India, were all serious objections to the plan. A series of detached earth-works, occupying well selected points round the ground and buildings to be defended, so placed as to aid in mutual defence, and as few in number as was consistent with this object, would form the best and cheapest defence of the position at Bangalore.

As regarded the important question of water-supply, there was nothing conclusive before the Government of India, but it appeared that under ordinary circumstances a supply might be drawn from the Alsoor Tank by very feasible arrangements. An Estimate had lately been sanctioned for the improvement of that tank. It was believed, however, that the supply from the tank would be at once more convenient and more easily secured, if a subterranean masonry duct or culvert were led from the tank to the Barracks, and the water there raised at one lift. Of the practicability of this the Officers on the spot would judge. Reservoirs within the entrenchment, to be kept supplied from this source and from the rain-fall on the buildings, should also be provided for the security of supply in case of an investment. Of the expediency of the proposed establishment of the Arsenal and Commissariat Stores in the old Infantry Barracks, the Government of India entertained grave doubts. The conversion of those buildings to their new purpose would necessarily involve much expense, and the permanent establishment of *two* entrenched positions requiring separate garrisons, which this proposal involved, was strongly objected to, and it was thought preferable to retain the Arsenal where it stood for the present, and arrange, if possible, for the construction of a new one in the immediate vicinity of the Dragoon Barracks, and embraced in the same system of defence. It was probable that the completion of the Railway to Bangalore might affect the extent of Arsenal accommodation required at that place.

The question of the provision of stables for the Cavalry has been allowed to stand over for the present.

Fortified post at Poona.

The general question of the expediency of constructing a fortified post at Poona was raised by the Bombay Government.

[*P. W. Dept.*] The choice of site was limited to two positions, the neighbourhood of the Arsenal and the Sungum, or the angle at the confluence of the Moolla and Moota Rivers. The Committee convened to report upon the defences of the Station, recommended the construction of the post near the Arsenal, and of a masonry tower at the Sungum, but the Commander-in-Chief of Bombay, and His Excellency Sir Hugh Rose, to whom the question was referred, were in favour of the Sungum site.

There could be little question that Poona, the site not only of a very large European Station and of a dangerous native city, but the immediate base of all operations in the Deccan, should have a fortified position of rather a high class; general sanction has therefore been given to the erection of the fortified post on the Sungum site.

This and other similar projects for strengthening our large Military positions will be included in the Public Works Budgets as the opportunities and means of execution shall permit.

Delhi Barracks and Fortifications.

His Excellency the Governor General on his visit to Delhi in January 1860 had an opportunity of considering the proposals which had been made for the accommodation of the Garrison of that city, and for its Military occupation, and the following decisions were come to on the several questions raised :—

The Garrison to be provided for was one Regiment of European Infantry, one Horse Battery, and one Reserve Company of Artillery, and provision for the cover of these could be made by devoting the southern half of the Palace enclosure to the troops, and the northern half to Officers' quarters, and to the yards of the different Departments.

The clearance in the Palace enclosure to be completed by the removal of the street running north from the Delhi Gate, and of the shattered and ruinous arcades between the Lahore Gate and the Dewan-i-am. But isolated buildings of architectural or historical interest were to be preserved.

The Dewan-i-am to be converted into a Garrison Hospital, should it be clear that it was in all respects suitable, but care to be taken that the beautiful interior of the building should be injured as little as possible. This restriction would not interfere with the erection or enlargement of such external verandahs as might be necessary for the accommodation of the sick, as the exterior of the Dewan-i-am has no features which need be preserved.

The Dewan Khas to be cleared of verandahs and the like, which disfigured it, and to be restored, as far as practicable, to its former state. It was not intended that expensive artistic embellishments should be renewed, but the marble trellis, which was removed for safe keeping, was to be re-erected in its original position, as well as any similar ornaments which might have been preserved.

The buildings along the Jumna face to the south of the Dewan Khas to be includ- [*P. W. Dept.*]
ed in the arrangements for the accommodation of the troops, any fragments of artistic work that might have value being removed where the appropriation of the building rendered them likely to suffer damage. The Dewan Khas to be isolated entirely from these buildings by the removal of a small portion of them.

Measures to be taken for the establishment of heavy Artillery in position on the barbicans of the two great gate-ways to command the city and the Jumma Musjid, and for establishing heavy guns at one or two more points to command those parts of the city not in view from the gate-ways.

The demolitions recommended by the local authorities round the Palace and stretching to the Jumma Musjid to be carried out, but not to include the removal of small isolated temples, the retention of which would be of no serious detriment.

Estimates of the expenditure required for carrying out these orders, with Plan showing the general disposition of the buildings, and detailed Plans of the Barracks to be erected in the Palace, were submitted in July, but no orders were issued till January, when, in consequence of a desire expressed by the Lieutenant Governor to concentrate work at Delhi, even, if necessary, at the expense of other Stations, on account of the prevailing distress in the neighbourhood, the matter was taken up.

The buildings proposed to be preserved are—

Dewan Khas.
Dewan-i-am.
Mootee Musjid.
Ukab Hummam.
Summun Boorj.
Sawun Bhadon, Heera Mahal, and Siah Boorj, the last to be used as a Dead-house.
Rung Mahal, to be made into a Dispensary.
Ussud Boorj, to be made into a Reading-room.
Aqueduct in the garden.
Nukkar Khana (or Nobut Khana).

This selection, as also the general arrangement of the buildings and the Plan of the Barracks, have been approved, but some suggestions have been made, calculated to reduce the cost of the latter.

It was proposed to convert the Dewan-i-am into a Church for the Garrison, by clearing it of the ruinous buildings on the top, and of the unsightly additions which were made to it to fit it for a Barrack; but His Excellency the Governor General directed that the platform and gallery on the east side should not be injured or disturbed, and that the rest of the ornamental architecture should be carefully preserved.

[*P. W. Dept.*] The following proposals for restoring the buildings, &c., of interest, as far as possible have been approved:—

1st. The domes, which had been removed for the sake of their gilt copper, to be restored in red stone and marble.

2nd. The marble every where to be cleaned and repaired; the marble throne, open-work, screens, and other similar objects of art, to be restored to their position and repaired.

3rd. The gilding of the marble in the Dewan Khas to be restored, and the roof to be repaired, gilt and painted.

4th. The ground in front of the Dewan Khas and adjoining buildings to be formed into a garden and enclosed by an iron railing.

The subject of the defensive arrangements at Delhi was submitted by the Punjab Government in April in the shape of definite recommendations by a Committee on the additional defences required for the Palace.

These recommendations were supported by His Excellency the Commander-in-Chief, and have been generally approved.

The Committee expressed their regret that the Esplanade clearances were not carried up to the street called Dureeba. They also objected to the temples left standing on the Esplanade. One was stated to be a large lofty building, 75′ × 27½′, within 190 yards of the Lahore Gate Battery. Another mass of temples was said to be 260′ × 130′, surrounded by a wall of great strength, and immediately under the Palace wall.

The Punjab Government has been consulted as to obtaining the removal of this wall, but the question of demolition was one into which other than Military considerations entered largely. And the extent to which the demolition should be pushed within the city having been carefully reviewed and determined by the Viceroy in person on his visit to Delhi, the Government of India was not disposed to sanction the further demolitions proposed.

The Committee lastly expressed their regret that the Railway should have been allowed to pass through Selimghur, and the Commander-in-Chief also expressed strong disapprobation of the course adopted for the Railway.

In 1858 a proposal was carefully considered by Government for crossing the Jumna at a point much above Delhi. This was strongly objected to by Lord Clyde, because we had at Delhi, in the existing fortress, a ready-made position, commanding at once the city and the communication across the river; and the course given to the Railway was selected in order that the existing works might become a *tête-de-pont* to the projected viaduct. It was regretted that the measure did not meet with Sir H. Rose's approval, but it could not be altered.

The recommendations of the Committee, on the assumption that the Railway's course could not be changed, were as follows :— [*P. W. Dept.*]

1st. That the bays of the bridge between Selimghur and the city, and from Selimghur towards the Jumna, be mined, so that the place could be readily isolated.

2nd. That the Railway should cross the interior of the Fort by means of a viaduct of large spans.

3rd. That the rampart of Selimghur next the Palace should be thrown down, and guns mounted on the Palace wall to fire through it, so that it (Selimghur) would be completely commanded from the Palace.

4th. The construction of a *tête-de-pont* on the east bank of the river at the end of the Railway Bridge.

All these were recommended also by Sir Hugh Rose, with the addition of a temporary earthen-work at the head of the present bridge-of-boats.

The Government was not indisposed to the adoption of any of these recommendations. But they all required more detailed information and estimates of cost, on which subject the Punjab Government has been addressed, as also on the subject of securing an outer line of defences to the citadel, a proposal for which was submitted by Colonel Abbott.

Improvement of the defences of the Fort of Agra.

The proposals for the removal of the Arsenal Establishments from Delhi, and their concentration at Agra, rendered it necessary to take measures for making the Fort at that place more secure.

The subject was reported on by a Committee of Engineer Officers in 1857, and the measures then suggested were of a more extensive character than the Government thought advisable.

Another Special Committee was therefore convened, with instructions to submit detailed proposals on the following points :—

I. Remedy for the evil of broken ground south and south-west of the Fort, affording access for troops and guns unseen from the ramparts, without necessitating extensive out-works, requiring large detachments to hold them.

II. The manner in which the Jumma Musjid and Tripolya north-west of the Fort were to be treated. Though not absolutely prohibiting the destruction of these buildings, His Excellency the Governor General stated that he would prefer a plan which, by the aid of minor changes, would render the buildings again available for the Mussulman population.

[*P. W. Dept.*] III. Means by which Artillery fire from the ramparts could be brought to bear more effectively on important points of approach without resorting to the sweeping measure proposed in 1857 of reducing the walls to about half their height.

It was remarked that other points would doubtless suggest themselves to the Committee, who were desired, however, to remember that moderate proposals would be most likely to lead to practical improvement.

The Report of this Special Committee was duly submitted, and it pointed out the chief defects of the Fort to be as follow :—

1st. Deficiency of flanking defence.

2nd. Want of glacis to cover the scarp walls.

3rd. The great height of all the batteries above the country, and the consequent plunging and defective nature of the fire, which is ineffectual at short ranges.

4th. The inequality of the ground on all sides, and the dangerous vicinity of the city on the north and west faces, affording cover to an enemy to within breaching distance of the walls.

The recommendations to mitigate or entirely remove the above defects were laid before the Commander-in-Chief, and in communication with His Excellency, the following orders were issued to the Government, North-Western Provinces :—

The cardinal object of reducing to the smallest dimensions all strong places, the retention of which is a necessity so long as we retain India, had not been sufficiently kept in view by the Committee.

The out-works proposed by the Committee were considered objectionable, as rendering it necessary to maintain a larger garrison, and being in themselves a source of weakness rather than of strength.

The irregular ground outside of the Fort to be sloped off, so as to prevent a succession of glacis, and expose the whole extent as much as possible to the view and fire of the Fort.

A glacis and covered way to be formed, the counter-scarp being strengthened by counter forts, where necessary to make it support the additional weight of earth.

The Jumma Musjid to be neither destroyed nor occupied, but mined, so as to admit of its being blown up in case of necessity.

Embrasures not concentrated in batteries, but scattered, to be pierced in the walls, so as to give a fire at a lower level than from the top of the walls.

The Public Works and Civil Officer to be called upon to submit Estimates of the cost of removing Jotee Persad's house, situated on the northern side of the Fort, and for effecting a clearance round the Jumma Musjid.

A report has likewise been called for from the Superintending Engineer, as to whether space could be found in the Fort to erect two or more earthen cavaliers, on which the garrison could, in case of need, place batteries, which would enable them to return the fire of assailants after the masonry walls should have been so injured as to be incapable of bearing guns; also as to the armament that would be necessary for the Fort, with reference to the above contemplated arrangement. [*P. W. Dept.*]

ECCLESIASTICAL.

Memorial Church at Cawnpoor.

The original proposition in connection with a memorial to be erected at Cawnpoor, was made to Dr. Kay, the Principal of Bishop's College, by a Committee formed in London, who proposed to erect a Church for Native Christians. Dr. Kay was requested to circulate this proposition in India, but the feeling against this form of memorial was so strong that no steps were taken in the matter. Several desultory propositions were afterwards made from time to time, but nothing of a definite nature was done till August 1859, when Sir John Inglis, to whom several applications had been made by parties in England to be allowed to erect memorials over the spots where it was supposed some of those who perished in that Station in 1857 were interred, called a public Meeting to ascertain the feeling of the public on the subject.

At this Meeting the project of building a Church of suitable ecclesiastical character, in which the relatives and friends of those who fell might be able to place tablets or painted windows, and in which a place might be set apart for the inscription of the names of all (as far as could be ascertained), who lost their lives at Cawnpoor in 1857, was first discussed. Such an edifice, it was thought, would be most suitably erected in the immediate vicinity of Sir Hugh Wheeler's entrenchment.

The proceedings of this Meeting were laid before His Excellency the Governor General on the occasion of his tour to the Upper Provinces in 1859-60, and His Lordship, after visiting the Station and communicating with the Lieutenant Governor of the North-Western Provinces, expressed his hearty concurrence in the scheme, and promised that the ground for the building should be made over by the Government. It was thought that it would be in accordance with the feelings of those interested if the memorial were to partake more of a private than a Governmental character; but His Excellency promised, in the event of the amount of subscriptions showing that the plan was generally approved, it should not fall through for want of a subsidy from the Government.

It is true that Cawnpoor as a Military Station has no longer the importance which belonged to it when it stood upon the frontier of our territory, but it is quite important enough, and quite large enough, to warrant the erection of a new Church for the use of the garrison and the residents.

The total amount of subscriptions, including a grant by the Society for the Propagation of the Gospel, who desire to erect a suitable monument to the Missionaries who perished at Cawnpoor, is about Rs. 60,000, and the Government of the North-Western Provinces proposed to begin work with this money.

[*P. W. Dept.*] The Government has authorized commencement of the preparation of materials, and promised to double the amount of subscriptions, making the entire sum for the Church Rs. 1,20,000. The Government of the North-Western Provinces has also been instructed to invite competition for a design from certain gentlemen in India, and without wishing to define the style to be adopted, a preference has been expressed for Lombardic Architecture, a style very capable of adaptation to the climate and material of India, and which has not previously been attempted in any of our Churches on this side of India.

INDUSTRIAL WORKS.

Nagpoor Coal Fields.

A proposal having been made to the Home Government for the formation of a Company for working the Coal Fields in Nagpoor, the Government of India was requested to submit a Report on those fields, and to state their views on certain points in connection with the proposal.

The Coal specially referred to by Mr. Hayman, the projector of the proposed Company, was the Omrait or Chindwarra Coal. The Government of India was desirous of having the fields visited and reported upon by an Officer of the Geological Survey, but Mr. Oldham, the Superintendent of the Survey, was unable to spare the services of one, except with very serious interruption to the other and regular work of the Department. He did not, however, anticipate any injurious results from this delay, as the Coal Field was no new discovery. It had been visited and briefly described by the Revd. J. Hislop, of Nagpoor, and Mr. J. G. Medlicott, of the Geological Survey, had also visited the locality when engaged in the examination of the adjoining Districts of the Nerbudda; but there was nothing in the statements of either of these gentlemen which would lead one to suppose that the field, which is very limited, would prove rich in Coal.

Note.—Mr. Medlicott's is only a passing notice, and Mr. Hislop's paper will be found in the Geological Society's Quarterly Journal XI. of 1855, page 555. The paper is purely on the relations of the strata to certain other strata of India; it has no economic or practical information as regards the Coal.

Mr. Medlicott has been instructed to take the earliest opportunity to visit the locality and to report on its structure.

Kumaon Iron Works.

With the Report of 1858-59 was published a general Report on the progress and prospects of the Kumaon Iron Works by Mr. Sowerby, the Superintendent. It was then observed that both the cost and time of construction had exceeded what had been anticipated by that gentleman; but that considering the difficulties against which he had had to contend, the Government was unwilling to draw an unfavourable conclusion until the receipt of a Report from Mr. Hardy Wells, who had been specially deputed to investigate the subject.

The Report subsequently submitted by Mr. Wells was discouraging on some points; but that gentleman unfortunately started with a misapprehension of the nature and extent of the operations which were contemplated by the late Hon'ble Court in connexion with the Kumaon Iron Fields, and this misapprehension affected more or less his

conclusions throughout. Mr. Wells supposed that the operations in question were intend- [*P. W. Dept.*]
ed to be nothing more than an experiment on a limited scale, and under this impression he commented in strong terms of condemnation on what appeared to him the extravagant expenditure which had been incurred, so different from what was intended when the establishment of the works was first decided on; whereas the undertaking contemplated by the Home Government was in fact intended to be on such a scale as a considerable Company might initiate, that is, that it was to be a regular manufacture and not a mere experiment. What was wanted was the manufacture of iron on a considerable scale, both for the sake of its produce, and to show that it could be done profitably on such a scale as a manufacturing Company could compare with its own prospects.

It was impossible to say exactly how far Mr. Wells's condemnation of the expenditure at Dechowree had a basis of justice, or how far it was due to his pre-conceived idea that it was simply as a small experiment that the works were to be constructed. This and some other of his conclusions which seemed open to controversy, induced His Excellency to direct Mr. Oldham, Superintendent of the Geological Survey of India, to proceed to the spot and to report on the whole subject.

A very able and careful Report was duly submitted by Mr. Oldham, and it went far to show that the management of the works had been neither judicious nor successful. It is not necessary, however, to allude further to this point, as the Government has since accepted an offer made by a Company represented by Lieutenant Colonel Drummond to take over the works at a valuation. The Company with which Colonel Drummond is associated is a real and substantial one, and that Officer's own earnestness and singleness of purpose are pledges that the undertaking in which he and his coadjutors are about to embark, will not fail for want of being vigorously prosecuted. This arrangement holds out therefore the assurance that the public objects which the Government from the commencement had in view, will be more effectually attained than they were likely to be by a continuance of its own operations.

Establishment of Iron Works at Burwai in Nimar.

Major R. H. Keatinge, of the Bombay Artillery, Political Agent and Superintendent of Nimar, had long devoted his attention to the manufacture of iron, which abounds in the vicinity of Burwai on the Nerbudda, and is manufactured by the Natives in a very wasteful manner. He obtained the commendations of the Government North-Western Provinces for investigating and reporting on the subject, and at his suggestion a small Steam Engine and Rolling Mill were ordered from England for the purpose of rolling into useful shapes the balls of iron produced by the Natives. This was erected in the Mundlaisir Jail Workshops.

Major Keatinge left India in April 1859 on furlough to England, and having there heard that difficulties were experienced in working the machinery in Nimar, he visited the Iron Works in South Wales, with the view of acquiring information on the subject. He found, however, that what he wanted to know could only be ascertained at the Charcoal Iron Works of Sweden and North Germany. Major Keatinge visited those works, and the result was that he recommended the erection of a small Blast Furnace at Burwai

[*P. W. Dept.*] in Nimar, which he estimated to cost £2,700, including a Steam Hammer and a Rolling Mill. His suggestion was adopted, and a young Swedish gentleman, Mr. Nils Mitander, trained in the Government School of Mines at Falen, has been engaged as Manager of the Works.

Mr. Mitander arrived in India last November, and a Report has been received of the commencement of operations by the opening out of five old mines in the neighbourhood of Burwai.

MARINE.

Laying of the first stone of the Alguada Reef Lighthouse. Appendix D.

In the Appendix will be found an interesting account describing the successful commencement of the foundations of the Alguada Reef Lighthouse. Much praise is due to Captain Fraser, the Superintendent of the Works, for the hearty spirit with which he is carrying out the important work entrusted to him.

NAVAL.

Graving Dock at Bombay.

In the Report for 1859-60 it was stated that the construction of a Graving Dock at Bombay had been authorized at a cost of Rs. 4,80,056. A sum of Rs. 50,000 was set aside in the Budget of 1860-61 for expenditure on this work, but the Government of Bombay subsequently reported that, partly owing to the alterations which had been found necessary, and partly to the great rise in prices since 1855, when the Estimate was first made, the cost could not now be reckoned at less than eight and a half lakhs of Rupees. Under these circumstances, and as there was no such pressing necessity as to require the immediate commencement of the work, it has been struck out of the Budget, and the sum made available for other works more urgently needed.

AGRICULTURAL.

Conservation of Forests.

The question of the proper conservancy of Forests in various Provinces of the Bengal Presidency has been under the consideration of Government in this Department during the year under review.

The very large and rapidly increasing demand for timber for the use of the Public Works Department and for Railway purposes during the past few years, had led, in the absence of efficient means for conservancy and supervision, to much indiscriminate and wasteful felling. This demand was not likely to decrease; and as in some Provinces the very possibility of maintaining a supply for future years would be threatened by the continued unrestricted or imperfectly supervised operations of Contractors in the forests, the Government has been taking steps to arrest the threatening danger.

Superintendent of Forests have been appointed in Oudh and the Saugor and Nerbudda Territories, and an Officer has been deputed to explore the Government

forest tracts of Nagpoor, whilst the Commissioner of that Province and also the Resident at Hyderabad have been invited to submit proposals for placing under due supervision the forests within their authority. A Superintendency of the Forests in Kumaon, Gurhwal, and Dehra Dhoon, is already in operation. [*P. W. Dept.*]

In order to secure concurrence of action in establishing and maintaining a system of conservancy both in the Provinces where it already exists, and in those in which it was proposed to be introduced, it was resolved that all business connected with forests and conservancy should be dealt with in the Public Works Department, instead of being divided as before.

The plan pursued in the North-Western Provinces, of excluding Contractors from the forests, and taking every thing, including cutting and selling, into the hands of Government, is the more complete one, and the best for the forests; but the Government was not at present disposed to extend this plan to all the Districts in which it had not already been established. The possibility of organizing at one stroke a superintendency sufficiently large for these purposes was very doubtful. The adoption of the plan on a large scale would involve two evils difficult to guard against, 1st, the undue increase of a Government expenditure producing at first very slow returns, and not easily tested or checked; 2nd, the chance of putting real impediments in the way of the Railway Companies, who would be able to draw their supplies only from those forests in which the Government superintendency is fully established. It was therefore desired that in organizing the system of conservation in the Saugor Territories and in Nagpoor, the Local Administrations should provide rather for a state of things in which the operations of Contractors are sufficiently supervised than for a system which excludes them altogether.

AGRICULTURAL—IRRIGATION CANALS.

Excavation of the Boolundshuhur Branch of the Ganges Canal.

This work has been undertaken at the present time, in order to give employment to the famished population of the Muttra District. The cost of this branch of the Canal is roughly estimated at three lakhs, and the work is designed for the irrigation of the Doab lying between the River Jumna and the Kuroon Nuddee.

Effect of the Ganges Canal in the present scarcity.

Appendix E.

Annexed will be found a Report by Captain Turnbull, the Superintendent General of Irrigation, North-Western Provinces, showing the action of the Ganges Canal and the benefits that resulted from irrigation in mitigating the effects of the present scarcity.

Captain Turnbull is unable to give accurate details until he has received the Financial Returns of the current official year; but he makes an approximate calculation based on the results of the Eastern Jumna Canal for the preceding year, that the Ganges Canal has brought into the market 4¼ millions of maunds of grain, irrespective of sugar and cotton, besides greatly facilitating the transport of grain from the Lower Provinces.

[*P. W. Dept.*] The Lieutenant Governor's own testimony to the effects of the Canal is also most valuable and interesting, as is that of Mr. Fleetwood Williams, the Commissioner of Meerut, which is quoted by His Honour.

Proposal of the East India Irrigation and Canal Company to carry out without guarantee Works of Irrigation and Navigation in the Province of Orissa.

This proposal was brought before the Government of India through the Secretary of State, and it was the earnest desire of the Government that no time should be lost in arriving at terms of a contract mutually satisfactory, and no exertions spared to facilitate, in the most liberal sense of the contract, the operations of this Unguaranteed Company.

Nothing satisfactory could, however, be done till the Company sent out an accredited Agent with full powers to treat with the Government, and to make himself personally acquainted with the peculiarities of Orissa and of its people, and it was strongly urged upon the Company to adopt the course at once, if any progress towards a final agreement was to be looked for.

Dam across the Punnyar River and certain works connected with it for irrigating a portion of the South Arcot District, Madras Presidency.

The primary object of this work is to afford irrigation to 78 villages on the south side of the river, and it is expected that the increased revenue obtained thereby will be Rs. 6,125, or 10 per cent. on the outlay, Rs. 61,000. The project was strongly supported by the Board of Revenue in 1858, but its insertion in the Budget of that and subsequent years was prevented by the restriction on expenditure.

Subsequently, however, a Mercantile Firm, Messrs. Parry and Co., who possess large sugar works in the South Arcot District, offered to advance the funds necessary for carrying out the work on certain conditions, and the Local Government not being able to devote to the object any portion of the sum assigned to it for Public Works expenditure, recommended acceptance of the offer.

Exceptional transactions of this kind between the Government and private individuals are apt, however, to lead to misunderstandings. It was not therefore considered expedient by the Government of India to accept the proposal of Messrs. Parry and Co.; but as the amount of the Estimate was comparatively small, it was intimated to the Government of Madras that the Supreme Government would be prepared to sanction the execution of the work and the expenditure of the required sum as a special grant, provided that Government was satisfied that the character and importance of the project was such as to justify a recommendation that it should be made an exception from the ordinary rules.

The Government of Madras subsequently reported that the work was in their opinion of sufficient importance to justify such exceptional treatment, and that it would therefore be at once commenced upon.

[*P. W. Dept.*]

Ganges Canal Project for ensuring a more copious supply of water.

A project for ensuring a more copious supply of water for the Ganges Canal by improving the head-works of the Canal, was submitted by the Superintendent General of Irrigation in the North-Western Provinces. To carry it out, two works, differing in character and object, were recommended—

1st. The excavation of the Doodiah Channel, about a mile in length, 100 feet in width, and 5 feet in depth.

2nd. A permanent masonry dam across a branch of the river leading off from the old Ganges opposite Hurdwar to the main stream.

These projects were first brought to notice by Captain Morton in his Inspection Report of 19th January 1860, but it was expected that the existing channels would supply as much water as could well be used, and that after the dry season of 1859-60 the rains would be more plentiful than usual. These expectations were, however, disappointed, and it became important that the head-works should be so improved as to admit of a larger supply being turned into the Canal.

The Government of India, after obtaining the opinion of Colonel R. Baird Smith, C. B., on these proposals, authorized the excavation of the Doodiah Channel, as its execution would not only have the effect of guarding against the immediate risk of defective supply in an apparently unobjectionable manner, but would render unnecessary the grave risk of prematurely sanctioning the second work which was of a totally different character, and involved far more questionable results.

It appeared to the Government of India that any important diversion of the flood waters in the immediate neighbourhood of Hurdwar should not be decided on without first considering whether it would involve any risk to that town, or to the Canal head-works at Myapoor. Such results would involve most embarrassing consequences. It might not be altogether inexpedient to have such a dam, but to sanction it on the imperfect information before Government would be to incur formidable risks without a professional judgment as to their possible issue. The Government of the North-Western Provinces has been requested to furnish more detailed information in regard to this project.

North-Western Provinces Canal Returns for 1859-60.

The following is an Abstract of the Revenue Report of the Superintendent General of Irrigation in the North-Western Provinces for 1859-60 :—

GANGES CANAL.

The following Table will show the progress made by this Canal since it commenced to yield Revenue :—

	Capital expended to end of year.	Maintenance and repairs.	Income.	Deficit.
	Rs.	Rs.	Rs.	Rs.
1855-56	1,62,05,673	4,01,259	48,600	3,52,659
1856-57	1,73,45,953	3,49,143	1,09,760	2,39,383
1857-58	1,75,75,466	2,53,150	88,790	1,64,360
1858-59	1,78,84,063	4,59,539	1,63,554	2,95,985
1859-60	1,82,63,874	4,63,129	3,05,097	1,58,032
Total ...	... ...	19,26,220	7,15,801	12,10,419

[*P. W. Dept.*] This shows on the five years' operations a balance of charges amounting to Rs. 12,10,419, exclusive of interest on Capital, which, at 5 per cent. per annum, amounts to Rs. 39,86,492 more.

The present increase of income is satisfactory, and the more so because it is not accompanied by any great increase in the cost of maintenance. It may be thus analysed :—

	Sale of water.	Rent of Mills.	Navigation.	Sale of Canal Produce.	Sundries and Fines.	TOTAL.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1858-59	81,131	11,953	46,495	17,659	6,316	1,63,552
1859-60	2,06,520	17,801	47,220	25,523	8,033	3,05,097
Increase in 1859-60...	1,25,389	5,848	725	7,864	256	1,41,542

As might have been anticipated, the bulk of the increase is in water rent; and as the main object of the Canal is irrigation, it is worth while to examine this item more closely, as in the following Table :—

		Amount of water rent.	Miles of irrigating Rajbuha.	Receipts per mile of Rajbuha.
		Rs.		Rs.
Khureef	1858-59	28,156	696·5	40·42
	1859-60	68,839	1066	64·57
Rubbee	1858-59	52,975	993·5	53·35
	1859-60	1,37,682	1236·25	111·37

Calculations from this show that the increase of water rent was nearly twice as great in proportion as the increase in the length of irrigating Rajbuha. The increase in the last column is common, more or less, to all the Divisions of the Canal in which the comparison can be instituted, except the Cawnpoor Division, which exhibits a small decrease, though there was a considerable increase in the actual receipts.

The Government, North-Western Provinces, reports as follows regarding the beneficial effect of this Canal :—

"During the present disastrous season, the operation of the Canal has been most beneficial, and the Lieutenant Governor is glad to have the opportunity of bearing his testimony to the great exertions of the Canal Officers in maintaining the supply, and making it as widely accessible as possible. It is impossible to over-estimate the immense

usefulness of this magnificent work during the last few months. As separately reported, hardly any Rubbee crop would have been produced in the Districts of the Northern Doab but for the irrigation available in some degree from scattered wells, but in a much larger degree from the Ganges Canal and its branches, and yet the harvest has been by no means a barren one. The whole process by which the crops have been brought to maturity has been assisted by irrigation. The soil was saturated from wells or from the Canal to admit of its being ploughed. The seed germinated only with the aid of irrigation, and it is with the same aid only that the crops have been advanced to maturity. There can be little doubt that the Revenue Return for the year 1860-61 will show a very large increase on that of its predecessor, and that the amount will more than cover the working charges." [*P. W. Dept.*]

The receipts for navigation show a decrease of Rs. 16,485 transit dues against an increase of Rs. 16,774 navigation.

The Superintendent General dwells on the inefficiency of the present head-works as a means of securing a working supply of water in the Canal. The present system is to construct temporary bunds across the river at the close of the rains, which are washed away by the first flood of the succeeding rains, after which the river is generally high enough to feed the Canal without bunds. Whenever, however, there is a failure of rain after the first flood, as was the case last year, the supply cannot be maintained without reconstructing the weir.

A project is being elaborated by Mr. Login, Executive Engineer, Northern Division, of permanent works at the head. They will cost about eight lakhs.

The Lieutenant Governor has witnessed the beneficial effects of the Canal on his late tour. Without it, and scattered wells, cultivation would have been impossible. As it was, the harvest has been by no means a scanty one.

Eastern Jumna Canal.

	Capital expended to end of year.	Maintenance and Repairs.	Income.	Profit.
	Rs.	Rs.	Rs.	Rs.
1858-59	13,94,614	84,714	1,81,022	96,308
1859-60	14,02,861	91,219	2,59,272	1,68,053
Increase in 1859-60 ...	.....	6,505	78,250	71,745

The profit is at the rate of 12 per cent. on the Capital. The receipts of 1858-59 were then the largest on record, and they have been now considerably exceeded by those of 1859-60. The increase is almost entirely in the item of water rent. The result is not only satisfactory in a financial point of view, but it is stated that not a single act of

[*P. W. Dept.*] coercion has been found necessary in levying the dues, and the tact and good management of the Canal Officers is shown by the fact that the fines inflicted on the irrigating community of 820 towns and villages amounted to no more than Rs. 1,221. The torrents, which had formerly been found so troublesome in the first 10 miles of the Canal, have been brought into thorough subjection. The Superintendent General is of opinion that the supply of water has been utilized to the utmost. The irrigated area is 227,490 acres, and the value of the produce is estimated by Major Brownlow at 60 lakhs. The excellent services of Major Brownlow, the Superintendent, and his Assistants, Ensign Willcocks and Overseer Sergeant Brown, have been acknowledged by Government.

Dhoon Canals.

	Capital expended at end of year.	Maintenance and Repairs.	Income.	Deficit.
	Rs.	Rs.	Rs.	Rs.
1858-59	3,96,961	13,131	11,668	1,463
1859-60	4,13,805	13,848	12,308	1,540
Increase in 1859-60...	.....	717	640	77

The cost of maintenance and the income is divided thus, so far as it can be done from the information supplied:—

	Maintenance and Repairs.	Income.	Profit.	Deficit.
	Rs.	Rs.	Rs.	Rs.
Beejapoor Water-course ...	2,762	4,742	1,980	
Rajpoor ... "	4,204	6,366	2,164	
Kutta Puttur Canal	4,161	972	...	3,189
Kullunga Canal	...	227		

Though a profit has this year been realized on the first of these water-courses, a much larger return is anticipated next year. The walls of the Canal where it is carried along a cliff side, have been raised, and the quantity of water increased thereby; and the Hope Town Grant, containing 500 acres of land capable of irrigation from the Canal, is about to change hands and to be brought under better cultivation.

The Superintendent General states that only Rs. 60 a year has been received from the villages of this grant for water, and adds "the system of large grants of land has proved very obstructive to the advancement of irrigation in the Dhoon."

The Rajpoor water-course derives the greater part of its income from mill rent. Its utility is not to be measured by its revenue. It supplies the whole of the town of Dehra with water for domestic purposes, free of all charge, and the Government also is saved the expense of digging wells for the Sirmoor Battalion (the only well in Dehra is 180 feet deep), and of maintaining an Establishment of Bhistees for the Jail. The Kutta Puttur Canal runs away with the profits of the rest. It was made chiefly on the requisition of the grantees of the West Hope Town Estate, who had in all 15,000 acres. They did not succeed in managing so large an extent of land, and the Canal suffered. Now, however, a portion of the estate has passed into other hands. Tea planting is going on extensively, and it is hoped that better times for the Canal are at hand. Cultivation too has in some degree been prevented by the dishonesty of the Native cultivators near the Jumna. When carts or bullocks, &c., have been supplied to them, they have frequently absconded with them across the river into the Nahun Territory, where civil suits cannot be instituted against them. The Lieutenant Governor has called for further particulars, with a view to address the Punjab Government on the subject. [*P. W. Dept.*]

The Kullinga Canal seems to be only in partial operation, in fact, until a new supply channel is constructed; the water fails for two months in the year. Already, however, lines of fresh cultivation are to be seen along its course.

The benefits conferred by these little water-courses are not to be measured by their profits. The established salubrity of Dehra, and the cultivation of otherwise unculturable land, and the growth of the tea-plant, make no appearance in an Account Current, yet the increasing number of English settlers will doubtless, in that respect, also cause a more favourable result soon to appear.

Lieutenant Colonel Turnbull states that since the construction of the masonry channel of the Rajpoor Watercourse, the guinea worm, with which half the inhabitants were afflicted, has disappeared.

Rohilkund Canals.

	Capital expended at end of year.	Maintenance and Repairs.	Income.	Deficit.	Profit.
	Rs.	Rs.	Rs.	Rs.	Rs.
1858-59 ...	1,23,450	16,559	15,544	1,015	
1859-60 ...	1,29,165	28,242	30,265	.....	2,023
Increase in 1859-60	.....	11,683	14,721	3,038	

The increase is due entirely to the drought, and the present Returns cannot be maintained in ordinary seasons. In fact the Superintendent General states that with the usual fall during the rains, and a few showers in the cold weather, the receipts must fall to a very low ebb. A few showers, he says, put an end to all artificial irrigation.

[*P. W. Dept.*] *Agra Irrigation Works.*

	Capital expended.	Maintenance and Repairs.	Income.	Deficit.	Profit.
	Rs.	Rs.	Rs.	Rs.	Rs.
1858-59 ...	77,501	10,694	8,164	2,530	
1859-60 ...	85,906	7,242	11,669	... ...	4,427
Increase in 1859-60	... ...	3,452	3,505	6,957	

The following Returns from the Superintendent General of Irrigation have been submitted by the Punjab Government :—

Western Jumna Canals and Nujufghur Jheel Works.

		Capital expended to end of year.	Maintenance and Repairs.	Income.	Profit.
		Rs.	Rs.	Rs.	Rs.
Western Jumna Canals.	1858-59 ...	16,24,381	1,56,514	3,29,452	1,72,938
	1859-60 ...	16,49,660	1,95,664	3,66,334	1,70,670
	Increase for 1859-60	... .	39,150	36,882	2,268
Nujufghur Jheel.	1858-59 ...	1,36,376	1,717	15,690	13,973
	1859-60 ...	1,36,954	2,050	16,240	14,190
	Increase for 1859-60	... ...	333	550	217

Collected in one Table, the result of the operations of the Canals under the Superintendent General of Irrigation for 1859-60 are as follows :—

		Rs.	Rs.
	Profit.		
Eastern Jumna Canal		1,68,053	
Western " "		1,70,670	
Nujufghur Jheel		14,190	
Rohilkund Canals		2,023	
Agra Irrigation Works		4,427	
			3,59,363
	Deficit.		
Ganges Canal		1,58,032	
Dhoon Canals		1,540	
			1,59,572
Net Revenue derived from Canals			1,99,791

The following is the Superintendent General's review of Canal operations:— [*P. W. Dept.*]

"In the Revenue Report of the Eastern Jumna Canal, it has been shown that with a direct return to Government of Rs. 2,60,000, the value of the Canal to the community amounted to 60 lakhs of Rupees, and this during a year when little or no produce was obtained from lands immediately adjoining those irrigated by the Canal.

"Now the total Canal Revenues for the past year were as follows:—

		Rs.	A.	P.	Rs.	A.	P.
North-Western Provinces...	Ganges Canal	3,05,096	13	11			
	Eastern Jumna Canal ...	2,59,272	11	8			
	Dhoon Canals	12,308	0	3			
	Rohilkund Canals... ...	30,265	0	4			
	Agra Irrigation Works...	11,669	4	2			
					6,18,611	14	4
Punjab	Western Jumna Canals	3,66,334	5	10			
	Nujufghur Jheel Works	16,240	1	10			
					3,82,574	7	8
	Total				10,01,186	6	0

or in round numbers say ten lakhs of Rupees.

"If therefore the direct revenue to Government on the Eastern Jumna Canal of Rs. 2,60,000 produced an actual benefit to the community in the neighbourhood of that Canal, amounting to 60 lakhs of Rupees, (and this benefit is, I believe, rather under than over-estimated,) it will be but reasonable to assume that the aggregate benefit derived by the agricultural population bordering on the whole of the Canals before enumerated, will amount to a sum not less than 230 lakhs of Rupees for the past year.

"Thus then it will be seen that the agricultural interests at stake in the well-being of the Irrigation Department are by no means small; that though the Canals may not apparently return a large direct interest for the outlay upon them, yet their indirect value to the Government in the prosperity of the country and the people is considerable. While these advantages, however, are borne in mind, the direct returns in the form of interest are not to be despised.

"The annexed Statement shows in a brief form the total outlay on capital and detail of charges and income to 30th April 1860:—

	Capital.			Interest at 5 per cent. on Capital.			Maintenance and Repairs.			Revenue.		
	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.
Ganges Canal	1,82,63,874	13	0	39,86,492	4	4	19,26,219	12	10	7,15,891	11	9
Eastern Jumna Canal ...	14,02,861	3	2	11,07,123	0	4	22,78,617	1	6	31,55,205	6	4
Dhoon Canals	4,13,804	12	8	1,40,178	3	1	1,59,732	8	1	1,68,896	14	0
Rohilkund Canals ...	1,72,405	12	10	22,009	10	2	1,11,189	2	8	1,88,548	12	2
Agra Irrigation Works...	85,905	12	4	18,794	13	6	24,401	0	4	56,512	9	11
Total ...	2,03,38,852	6	0	52,74,597	15	5	45,00,159	9	5	42,84,965	6	2
Western Jumna Canals...	16,49,659	15	10	4,72,723	0	3	42,59,140	15	6	82,49,967	9	3
Nujufghur Jheel Works...	1,36,954	2	3	9,135	14	8	70,113	14	4	2,50,000	13	5
Total ...	2,21,25,466	8	1	57,56,466	14	4	88,29,414	7	3	1,27,84,933	12	10

[*P. W. Dept.*] from which may be deduced the following account :—

"*Dr. The Irrigation Department in Account Current with the Government. Cr.*

	Rs. A. P.		Rs. A. P.
To interest at 5 per cent. on original works	57,56,456 14 4	By Revenue realized.	1,27,84,933 12 10
To Maintenance and Repairs ...	88,29,414 7 3	Balance	18,00,937 8 9
Total ...	1,45,85,871 5 7	Total ...	1,45,85,871 5 7

showing a deficit of Rs. 18,00,937-8-9, or, if we omit the cost of maintenance and repairs, it will be seen that, in spite of all the difficulties under which the Ganges Canal has been labouring, the Irrigation Department has returned 5 per cent. to the Government on the capital expended, and has a Reserve Fund of Rs. 70,28,476-14-6.

"It need not, however, be anticipated that the Ganges Canal will always form an unsatisfactory element of the calculations, and the following Statement of income, since it commenced to yield Revenue, will, I trust, show that the growth, however slow it may appear, is steady :—

	Rs. A. P.
Income for 1855-56	48,600 5 2
" " 1856-57	1,09,760 0 10
" " 1857-58	88,790 0 0
" " 1858-59	1,63,554 7 10
" " 1859-60	3,05,096 13 11

"Thus since 1857-58 we have very nearly doubled our income each year. I cannot flatter myself that this process will be exactly repeated during the present seasons, but still I am confident that there will be a considerable increase over the Revenue received last year."

N. B.—The complete Returns have been published as a volume of Selections.

COMMUNICATIONS.

Ooloobaria Canal.

In the Bengal Budget for 1859-60 was entered a project for a navigable canal from Ooloobaria, on the Hooghly River, to Moisraka, on the Damooda River, a distance of 7½ miles, the cost of which was estimated at one lakh of Rupees. In the orders on that Budget the Government of India expressed a willingness to see this work carried out by means of a local loan on the plan suggested by Lord Stanley.

The object of the proposed canal was to provide a safer and a shorter water commu- [*P. W. Dept.*] nication for the boats connected with the trade of the Damooda River, and the several lines of water communication in the Midnapoor District, when passing between Calcutta and the centres of trade in the Burdwan and Mirzapoor Districts. The canal would connect two points on the Hooghly and the Damooda Rivers, situated respectively 19 and 15½ miles distant from the junction of the two streams, and would thus afford an actual saving in distance of 27 miles, besides enabling boats to escape a somewhat dangerous river navigation.

The advantage of such a short water communication between these two rivers at this place has been recognized for a long series of years, and in 1838-39 two channels to answer this purpose were excavated, but from neglect and inefficient supervision they failed. No means were adopted to realize any revenue, and since 1845 nothing has been done on either of these cuts; one of them is, however, still used at high tides by small boats passing between the two rivers.

In 1854 the Magistrate of Howrah brought to notice the inconvenience caused to traffic, and the coal trade in particular, by the want of communication between the Hooghly and the Damooda, and the Executive Engineer, Burdwan Division, and the Superintendent of Embankments, impressed with the importance of the work, continued to devote their attention to the subject. Consideration of it, however, was necessarily postponed during the unhappy events of 1857. In April last year a project for a new canal was submitted, based upon a series of accurate levels and observations of the tides. The Estimate provided for an excavated channel, 4 feet in depth below the lowest water level, with a breadth of 20 feet at that level, and a top breadth of 92 to 109 feet. Masonry inverts and revetments will be constructed at both extremities of the canal, which will form the foundation and abutments for bridges to be erected hereafter, as well as for gates, if found requisite. Masonry drains and culverts through the canal embankment will pass off the drainage of the adjacent country.

As to the remunerative nature of the canal, the Officers of the Revenue and Public Works Departments were of opinion that it must prove very profitable. There can be no doubt that all the coal boats that now pass down the Damooda will avail themselves of the canal, and from the Estimates of the Officers, and the best data obtainable, the quantity of coal sent down by boat may be taken to be from 16 to 20 lakhs of maunds, out of 66 to 68 lakhs, the total produce of the mines at present. Coal, however, is not the only produce which is likely to pass in boats through the canal. Silk, indigo, gram, and rice are exported from the rich country about Guttal, Kheerpoy, Chunderkona, Chuttergunge, and other places, and now pass down the Damooda. These will undoubtedly feed the new canal. According to the most moderate estimate of the traffic, there appears a fair prospect of realizing a net income of about Rs. 15,000 per annum, which would increase as the resources of the districts improve. Deducting the cost of keeping the canal with its tow-path, &c., in repair, and for Establishment, there would remain clear about 9 per cent. on the outlay, calculating the toll at 8 annas per 100 maunds, which is the same as that levied on the Circular Canals near Calcutta.

[*P. W. Dept.*] With reference to the question of raising a loan for the prosecution of these works, the Bengal Government had received intimation from several of the owners and shareholders of the Collieries and Companies interested in the execution of the proposed canal, that they were willing to subscribe towards such a loan at 6 per cent., repayable at the end of a fixed term, say after 25 or 30 years. If the profits were as anticipated, it would not only pay the interest on the capital, but would form a sinking fund, capable of paying off the original loan altogether in 21 years.

The terms of the proposed loan were in accordance with what was understood to be the intention of the Secretary of State. But the Government of India was not satisfied that they were such as should be accepted. It admitted of no private enterprize, and involved no risk of loss, and no share of profits on the part of the subscribers to the loan. Information was requested as to whether it could not be arranged to carry out the project, wholly or in part, by private enterprize, or that the parties most interested should bear such share of the expense or risk as might form a substantial proof of their opinion of the soundness of the scheme. The Government of India did not wish to guarantee interest, but it was thought that the tolls might be made over for a term of years to the subscribers of the funds, who might either execute the work by their own Engineers, or have it done at their expense by the Engineers of Government, and might also be assisted by a grant of Government funds. In this case a part of the risk would be borne by the persons who raised the money, and the profits of the undertaking and proprietorship of the works would be theirs, under such conditions as might be deemed proper.

Subsequently, however, on the recommendation of the Government of Bengal, this arrangement was not carried out, and it was determined to carry out the works out of the surplus navigation tolls at the disposal of the Local Government.

Trial of corrugated iron pontoons for bridging purposes.

At the instance of the Government of Bengal, sanction was given to the purchase of five corrugated iron pontoons for trial for bridging purposes. Their fitness for the purpose was subsequently proved by actual experiment, and as it was thought that bridges of this description would doubtless be found both useful and cheap, not only on large rivers, but on coast back-waters and creeks, and on the inundation canals in the Punjab and Sindh, a tracing of the Drawings of the pontoons, with full particulars as to the construction of the bridges, were distributed to the Local Governments and Administrations.

Question of maintaining and completing Trunk Roads which run more or less parallel to Railways in course of construction, or to be constructed hereafter.

This subject required to be considered not only in a commercial and social, but in a Military point of view. It might be urged on the one hand that it is injudicious to expend money on trunk roads which are likely to be superseded in a few years by railroads, and on the other, that it would be most unwise for the Government to make itself dependent almost exclusively on the Railways for the means of moving either men or munitions of war, seeing that such roads, in the event of intestine commotions, are peculiarly subject to interruption.

After careful consideration, the following conclusions were arrived at:— [*P. W. Dept.*]

That trunk roads of manifest Military importance should be preserved from deterioration, and where unfinished should be completed with all convenient speed, but that they should not be constructed in the expensive style originally intended. For, to apply very large sums to the construction of roads on lines parallel and contiguous to those selected for Railways would be as unwise as to abandon existing roads. The commercial and social utility of such roads need not be disputed, and it may be admitted too that they might on occasion prove of great Military value; still the necessity for them is not so obvious or so pressing as to justify a large outlay upon them in times when in every part of India public works, even more intimately connected with the advancement and material prosperity of the people, are left unexecuted for want of funds.

It has also been laid down as a general rule that whatever new roads are made in the immediate neighbourhood of Railways, they ought to be such as will serve as feeders to them, without which no Railway of considerable length can fully answer its purpose.

Memorandum by Captain Beadle on Roads, &c., in Cuttack. Appendix F

Annexed is an interesting Memorandum by Captain J. P. Beadle, late Superintendent of Embankments in Bengal, regarding the roads in the District of Cuttack and the Tributary Mehals, and on the water communications through part of these Districts and Hidjellee.

Abolition of tolls on Imperial Roads.

The question of the expediency of levying tolls upon the roads of the country, with the view of rendering them self-supporting, had long engaged the attention of the Government of India. In addressing the Home Government on the subject in 1857, the general levy of tolls was advocated, and the several Local Governments were then invited to communicate their views as to the best method of making roads self-supporting by a systematic levy of tolls. The views of the Government of India were concurred in by the Court of Directors, who gave it as their decided opinion "that only in exceptional cases should so obvious and appropriate a means of meeting the heavy expense of construction and maintenance of roads be neglected."

The replies of the Local Governments were duly received. Throughout, the opinions expressed by the various Officers of the Local Governments, with the single exception of that of the Lieutenant Governor of Bengal, it was perceived that while the abstract justice of the measure as a means for raising funds for the maintenance of roads was generally admitted, the policy of imposing them on trunk roads, or on roads passing through any tract of level country, was considered to be open to great objections.

The Lieutenant Governor of Bengal, on the other hand, was decidedly of opinion that no form of tax was so little likely to be distasteful to the Natives; and with respect to the extortion apprehended by some as likely to take place, he instanced tolls on Ferries as presenting far greater facilities for extortion and abuse, while in his tours in all parts of the country, though he laid himself out to hear complaints of all kinds, he never heard one of this nature.

[*P. W. Dept.*] All were, however, agreed on the expediency of establishing tolls upon roads made in localities where great natural impediments to intercourse have been overcome, such as roads over mountain passes, bridges over rivers, &c.

Owing to circumstances which it is not necessary now to refer to, the matter was allowed to lie over until the question was reviewed by the late Mr. Wilson during his visit to the North-Western Provinces. From what then fell under Mr. Wilson's observation, he came to the conclusion that either the levy of tolls on roads should be discontinued, or if not, that it should be put upon another footing altogether.

From the Returns which were thereupon obtained of the gross collections of tolls on Imperial Roads, and the cost of collection, it was evident that the desired object of maintaining the roads without drawing upon the general revenues of the country, had not been attained. To increase the income it would be necessary to add very largely to the number of toll bars, but in that case the cost of collection would be so much increased as to make it doubtful if they would pay, unless, indeed, the charge at each bar were as high as at the existing more widely distributed bars. This would doubtless be felt to be oppressive. It would probably repress traffic, or occasion so much evasion as to cause the collections to fall off. On the other hand, whilst the tolls were collected at wide distances, they formed a grievous local tax in those few districts where they were situated.

Moreover, it appeared from experience on the Grand Trunk Road in the North-Western Provinces—experience derived from circumstances most favourable to a profitable levy of tolls on an unenclosed Imperial Road—that the cost of collection was so high that, looking upon the question as one of public revenue, it appeared inexpedient to continue a system under which a small and inadequate contribution to the public revenue was raised in a most unpopular shape, and at such a heavy cost for collection, when the amount could be defrayed from the general taxes in a much less costly way, the difference being, under the existing system, so much direct loss to the public.

Under no circumstances is the levy of tolls on roads free from objection, but it is least oppressive and unpopular, and most efficient as a means of raising money, in a mountainous country, where, but for the road on which the toll is levied, wheeled carriages could not travel at all. In such localities, for instance, as the Western Ghats, the advantages of a good road and easy ascent are so striking that the toll is willingly paid, and there is no attempt at evasion. In such situations the people generally would vote for roads with tolls, rather than have no roads at all, and indeed voluntary petitions to the effect have been presented by bodies of Brinjaries, the pack-cattle carriers, between the Deccan and Western Coast.

In all other situations, wherever a cart can proceed in dry weather, a toll is the most unpopular and seemingly the least efficient mode of providing funds that can be devised, and viewed simply as a question of how the money is to be raised, there cannot be a doubt that the sums raised by this means could be collected with less objection and at less cost in other ways.

The conclusions arrived at by the Government of India after a very careful consideration of the whole subject, was that it was desirable to abolish tolls on Imperial Roads passing through the open country and on permanent bridges on such roads, and to provide for their maintenance from the general revenues; but that they should continue to be levied in cases where a heavy annual outlay is incurred for temporary works, such as Boat-bridges and Ferries at river crossings on Imperial Roads, and also in cases where extraordinary natural obstacles have been overcome, such as in the roads over the Western Ghats in the Himalayas, &c. [*P. W. Dept.*]

Effect was given to this Resolution in a Notification issued on 27th July 1860.

It is proper, perhaps, to point out that this Resolution refers only to Imperial lines, and does not interfere with the imposition of tolls where they are required as a means of making or keeping in repair a road of merely local importance.

Indus Tunnel at Attock.

In the Report for the past official year, it was noticed that, thinking Major Robertson's scheme for this Tunnel well worthy of trial, His Excellency the Governor General had sanctioned the excavation of an experimental drift, and had placed Rs. 10,000, and the services of three Companies of Pioneers, at the disposal of that Officer for carrying out the work.

Major Robertson has since proceeded to England, but the work is being vigorously prosecuted by Captain Sandilands, of Her Majesty's 8th Foot, and Lieutenant Chalmers, of the 24th Punjab Infantry. It is stated by the Lieutenant Governor of the Punjab, that the deepest portion of the channel has been passed, and that there does not appear to exist on the minds of any a doubt as to the success of this important and interesting work, a work which excites the wonder and admiration of the Natives of the country more than the Railway or Electric Telegraph, and to visit which they come from distant places, especially from beyond the Khyber.

It may here be shortly stated that the total length of the drift is 1,505 feet.

Distance completed on west side	235		
" " on east side	153		
...	——	388	"
Remaining at the end of April 1861		1,113	feet.

Lahore and Peshawur Road.

In the Report for 1859-60 an account of this road, and the expenditure which had been incurred on it, was published. Further particulars bringing the history of the road down to the present time, will be found below.

In April 1859 His Excellency the Governor General, while in the Upper Provinces, intimated his desire that the Lahore and Peshawur Road should be prosecuted to completion as a metalled and bridged line as vigorously as the means at the disposal of the Punjab Government in funds and staff permitted; Estimates for those bridges which were omitted from the project of 1858 were therefore called for, and the preparation of material for them authorized.

[*P. W. Dept.*] Major Robertson, the Superintendent of the Road, was also invited to reconsider the substitution of masonry for timber piers in any of the bridges yet uncommenced, on which that change would not be attended with great delay, and was otherwise very desirable. Revised Estimates for metalling the road were also asked for.

The Estimates for bridging and substituting masonry for timber bridges were submitted in July 1860, and the following sums were sanctioned :—

Additional Bridges.			Rs.
Masonry Bridge over the Dheena			68,178
Timber Lattice Bridge over the Sohan River			3,52,161
Timber Bridge over the Leia			89,291
Approaches to the foregoing two Bridges			7,923
Masonry Bridge over the Chikoree Nullah			60,888
Two bridges, one of masonry liable to submersion, and one of timber over the Chall Nullah ; cost of bridges		36,070	
Less cost of temporary road formerly sanctioned		9,580	
			26,490
Bridges over Nullahs Nos. 114½ and 115, falling into the Cabool River beyond Attock.			
Masonry Bridge of 9 spans of 30 feet		20,390	
" " of 6 " of 10 "		3,578	
Embanked Road...		1,926	
		25,894	
Less temporary road before sanctioned		950	
			24,944
Substitution of masonry for wood in piers of Bridges.			
Jundeewala Nullah Bridge on masonry piers ...		12,829	
" " " on wooden piers ...		11,261	
			1,568
Bishendom Nullah Bridge on masonry piers ...		39,490	
" " " on wooden piers ...		19,310	
			20,180
Substitution of masonry for wood in entire Bridges.			
Nos. 13 and 14 in the 1st Division		4,853	
Timber Bridges		3,673	
			1,180
Bhimber Nuddee Bridge...		39,876	
Timber Bridge		28,603½	
			11,272½
Bridge at Jhelum		2,830	
Original design in wood		2,511½	
			318½
Carried over			6,64,394

Brought forward		6,64,394	
Seal Nullah Bridge	6,267		
Timber design	5,886		
		381	
Bridge No. 3 of 3rd Division	2,538		
Timber Bridge	2,960		Saving
		...	422.
Bridge No. 20½, 4th Division	5,352		
Timber design	4,767		
		585	
Bridge No. 113, 4th Division	20,390		
Timber design	21,780		
		...	1,390
Bridge No. 120½	5,279		
Timber design	5,164		
		115	
Bridge No. 122	10,400		
Timber design	11,129		
		...	729
Bridge No. 126	25,072		
Timber design	25,326		
		...	284
Addition of a water wing to the Vah Bridge, to resist a set of the current		2,459	
Total ...		6,67,934	2,825
Deduct ...		2,825	
Net amount of additional expenditure sanctioned ...		6,65,109	

The Estimate for completing the Chikoa Tunnel has not been sanctioned, as Major Robertson suggested that it might be deferred till all the bridges are done.

The Estimates for metalling the road were received in September 1860 and sanctioned; they amount to Rs. 13,85,193.

The sanctions given to the completion of the road are as follow:—

In October 1858	Rs.	11,69,379
In April 1859	"	22,219
For bridging and substituting masonry	"	6,65,109
For metalling	"	13,85,193
	Total Rs.	32,41,900
To which will have to be added—		
Chikoa Tunnel Estimate, to which sanction was deferred ...	"	60,081
	Total Rs.	33,01,981
Since added for Bridge No. 126	"	21,297
	Total Rs.	33,23,278

[*P. W. Dept.*] Of this about 2¾* lakhs had been spent prior to 30th April 1860, leaving 30¼ lakhs to complete the road, exclusive of the passage of the great rivers. This outlay will probably be spread over five years.

Roads in Nagpoor in connection with the development of the cotton resources of that Province. Appendix G.

In the Appendix will be found a recent communication from the Commissioner of Nagpoor, with the chief Reports which it enclosed, on the subject of the cultivation of cotton in that Province, and the construction of roads to facilitate its transport to the ports of shipment.

In connection with this subject a Memorandum was (see Appendix) subsequently submitted by the Commissioner of Nagpoor on a complete system of roads for that Province. This Memorandum shows that the requirements are as follow:—

Imperial Roads.

1st Class	... ...	104 miles.
2nd "	... ...	545 "

Provincial Roads.

2nd Class	... ...	460 miles.
3rd "	... ...	300 "

District Roads.

4th Class	... ...	1,000 miles.

The roughly estimated cost is—

100	miles	1st class road,	@	Rs. 7,000	per mile	...	7 lakhs.
1,000	"	2nd "	"	" 3,750	"	...	37½ "
300	"	3rd "	"	" 1,000	"	...	3 "
1,000	"	4th "	"	" 250	"	...	2½ "
				Total		...	50 lakhs.

The complete system for the Province will cost, therefore, on this Estimate not less than half a Million Sterling.

The cotton producing Districts are Nagpoor and Chanda, and outlets are provided by the Great Deccan Road northwards to Mirzapoor, and westward by the same road to Bombay; the southern road south of Nagpoor, passing through the cotton mart of Hingunghat, extends to Wurrora on the Wurdah River, whence a branch runs to Chanda. This will prove an important tributary to the stream of traffic northward, while the road from Hingunghat to Nachengaon will aid its escape towards Bombay.

* This is in addition to the 71 lakhs expended on this road prior to the submission of Estimates in 1858.

Raepoor does not export cotton at present, except of a coarse kind, and on a small scale, to or towards the Eastern Coast. The improvement of the present very rude and almost unknown track pursued by the Bunjaras is provided for. Raepoor will also be connected with the Great Deccan Road at Jubbulpoor. [*P. W. Dept.*]

What follows will show what is being done towards realizing the Commissioner's project.

The arterial line of traffic is the Great Deccan Road. Besides the portion in the Nagpoor Province, the Public Works Department of Nagpoor has been entrusted with the construction of its extension beyond the northern boundary as far as Seonee. Estimates have been prepared and sanctioned for the portion between Kamptee and a point nine miles beyond the northern boundary, and from Nagpoor southwards to within about half a mile of the river at Bhoree, a distance of 16 miles.

Beyond the Province, the section between Seonee and Jubbulpoor will be constructed by the Public Works Department of the North-Western Provinces, and an allotment of Rs. 90,000 has been made in the Budget for 1861-62 for this road. From Jubbulpoor to Mirzapoor a good metalled road already exists, and the larger streams, though not bridged, are provided with causeways, and are easily passable at all times, except during the monsoon, the cotton passing up in the dry months.

For the improvement of the road beyond the Province of Nagpoor on the west, in the Berar Territory, a sum of Rs. 100 a mile was sanctioned towards the close of last year. The Resident at Hyderabad has been requested to direct the Chief Engineer to visit the line, and report how much can with advantage be spent on this portion of the road to render it speedily fit for the easy transit of traffic. Further west on the Nizam's actual dominion, a certain sum was allotted for the repairs of the road as far as Aurungabad, and between that place and Toka, on the Bombay Frontier, the road is to be bridged and metalled.

To return to Nagpoor: Estimates have been submitted for the section of the southern road from Bhoree, 16 miles south of Nagpoor, the point where this road branches off from the Great Deccan Road to Kumbara, 13 miles beyond Hingunghat; the length is 41 miles.

Estimates have also been sanctioned for 48½ miles of the eastern road between Nagpoor and the Lucknee River, 12½ miles beyond Bhundara.

The whole amount of work already sanctioned in the Province of Nagpoor amounts therefore to 134½ miles of road, whilst further Estimates are still under preparation.

An outlay of Rs. 10,000 for the year 1861-62 has also been authorized on district roads.

Road from Russelkondah to Sonepoor.

In December 1853 an expenditure of Rs. 28,700 was sanctioned for the construction of a road from Russelkondah in Ganjam to Koinjoro, a small village near the extreme N. E. Madras Frontier. This road was completed as far as the Village of Sankarabol, about 4 miles north of

[*P. W. Dept.*] Koinjoro, and a Report of the matter made to the Secretary of State, who commented on the importance of the road taken in connexion with its continuation to Sonepor, and the facilities it would afford for cart traffic between the Nagpoor country and the Coast, and its civilizing influence on the wild tribes along its course.

The country between Koinjoro and Sonepoor is not under the jurisdiction of the Madras Government, but that Government has consented to continue the construction of the road at the expense of the Bengal Government.

MISCELLANEOUS, MONUMENTS.

Monuments over the Wells at Cawnpoor. Appendix H.

Annexed are copies of two letters addressed to the Government of the North-Western Provinces, regarding the Monuments to be placed over the two Wells at Cawnpoor, into which were cast the bodies of so many Christian sufferers in the summer of 1857. His Excellency was unwilling to defer to a season of less financial embarrassment the tribute of sorrowing respect due to the memory of those faithful soldiers and subjects of the Queen who were the victims of an excess of perfidious cruelty unparalleled even in that unhappy year.

Report on British Burmah. Appendix I.

In the Appendix will be found a Resolution recorded in this Department on the Report on British Burmah, drawn up by Mr. Temple and Colonel Bruce. It treats of only so much of the Report as relates to the Military and Civil branches of the Public Works Department.

Abandonment of scheme for forming a Town and Port at Dalhousie, Pegu.

The work, which had been in progress for the formation of a Town and Port at this place, was to a great extent destroyed by a great gale in 1857. At the same time the stoppage of all works that could be dispensed with on financial grounds threw the question of the Port into practical abeyance; but though it had been generally assumed that there was an end of the scheme, it does not seem to have been definitely pronounced by Government.

A Report was received in February last on the subject, which seemed to show conclusively that the Port had not been happily selected. It is not sheltered from the south-west monsoon; it is subject to violent gales, during which vessels have been lost in the Port, and the action of the sea in south-west gales extends up the river for some distance, rendering boat communication hazardous. Nor does its position at the extreme end of the district in a tract at present uninhabited, render it a convenient capital for the district.

Much was looked for in the establishment of Dalhousie as a ready Port of call and harbour of refuge, but it failed so utterly in the latter character, that the scheme has been finally abandoned.

RAILWAYS, GENERAL. [*P. W. Dept.*]

Progress on Railways.

The Progress Reports of the several Railways must be looked for in detail in the Reports of the Local Governments. It will be sufficient to note here the different lengths of line open for traffic at the close of the year—

In Madras 187 miles of the South-West Line, and 17 miles of the North-West Line.

In Bombay the line of the G. I. P. Railway from Bombay to Callian, 33·2 miles.

On the South-East Extension of the same, only 13·3 of the line from Callian to Sholapoor remained to complete the entire length of 248·5.

On the North-East Extension 73 miles of the line from Callian towards Jubbulpoor; two short branches of this line to Mahin, 1·4 miles, and Padus Dharree, 7·7 miles.

Of the Bombay, Baroda, and Central India Line, the portion from Surat to Doolia. The entire line of the Sindh Railway from Kurrachee to Kotree, 114 miles, was completed, so as to allow of the passage of Trains.

The works of the Eastern Bengal Railway are advancing favourably, and it is expected that the line from Calcutta to Kooshtee will be opened by May 1862.

The Calcutta and South-Eastern Line to the new Port of the Mutlah River is expected to be ready for opening by the beginning of next year.

On the East Indian Railway 313½ miles are now open, and it is expected that the main line to Bhaugulpoor will be ready by the middle of October.

In the North-Western Provinces the line from Allahabad to Etawah has been opened since the close of the year, and it is expected that it will be ready as far as Agra by December.

In the Punjab the earth-work on the line from Umritsur to Mooltan is nearly completed. The section between Lahore and Umritsur will probably be opened by the end of 1861.

It is but fair to add that the progress on the Punjab Line has been retarded by unfortunate differences arising out of charges brought by the Agent against the Chief Engineer. Both have since been removed by the Board of Directors. It is hoped that under the new administration matters will improve, and the works be prosecuted with vigour.

[P. W. Dept.] RESTRICTION OF RAILWAY EXPENDITURE.

Restriction of Railway Expenditure.

Under the belief that the Home Government, in estimating the Railway expenditure in India for 1860-61 at £4,750,000, intended to prescribe that sum as the limit of expenditure. The Government of India issued orders restricting the expenditure absolutely to that amount, and directing the suspension of many of the works in progress.

Her Majesty's Secretary of State, on receiving a report of this, ordered the withdrawal of the restriction, and stated that operations should not be delayed on those sections of lines which were advancing towards completion, or which the Government of India might consider of primary importance; the whole subject of Railways was in consequence taken into consideration, with a view to ascertain what sections came within the above description, so that in case of capital not being forthcoming for all, such sections might have the preference.

In the meantime, in accordance with the orders of the Secretary of State, the restriction was withdrawn before it had been generally enforced, and the works proceeded without material interruption, the result being an expenditure on Railways in India, for the financial year ending 31st April 1861, of about £6,000,000 instead of £4,750,000.

The further prosecution of Railway works in India became a question of serious consideration. From the latest Return obtained from England, it appeared that the situation on the 31st December 1860 was as follows:—

East Indian Main Line	£ 20,000,000
" Jubbulpoor	" 2,000,000
Madras Main Line	" 5,000,000
" Bellary	" 3,500,000
Great Indian Peninsula	" 13,000,000
Sindh Railway	" 1,400,000
Indus Flotilla	" 300,000
Punjab, Mooltan, and Umritsur..	" 2,000,000
" Delhi Extension	" 2,000,000
Bombay, Baroda and Central India	" 4,000,000
Eastern Bengal (Present Works)	" 1,400,000
Calcutta and South-Eastern	" 200,000
Great Southern-of-India	" 700,000
Total ...	£ 54,600,000

Total estimated amount of Capital required, as per detail given in the margin	£ 54,600,000
Total amount of Capital guaranteed	" 39,666,300
Total amount of Capital paid up	" 32,547,540
Total amount of Capital expended	" 31,186,404

The general result was, therefore, that, according to present estimates, which may possibly be exceeded, a sum of £56,000,000 would be required to complete the sanctioned Railway system of India, towards which £39,666,300 only had been provided through the existing Companies. Of this Capital of £39,666,300, £32,547,540 had been paid in by the Companies, and £31,186,404 expended in England and in India up to the 31st December 1860; so that by the close of the financial year on 31st April 1861, in round numbers, £34,500,000 would probably have been paid in, and £34,000,000 expended. The balances of some of the Companies would by that date have been considerably overdrawn, while those of others would be very small; and none would be at

all sufficient to complete the works which have been sanctioned, as appears by the sub- [*P. W. Dept.*]
joined Table :—

Designation of Railways.	Balance on 31st December 1860.	Estimated amount required to complete the undertaking in excess of that spent up to 15th November 1860.	
	£	£	Total.
East Indian Main Line	(At credit) 732,153	4,790,681	6,595,851
Ditto Jubbulpoor Line		1,805,170	
Madras South-Western (Madras to Beypoor) and Bangalore Branch	(Overdrawn) 15,380	559,964	3,544,036
Madras North-Western (Bellary), Arconum Junction to Moodgul		2,984,072	
Great Indian Peninsula, Bombay to Sholapoor	... ...	4,182,508	8,220,508
Ditto, ditto, to Hurdah and Oomrawuttee			
Sholapoor to Moodgul	(At credit) 536,717	1,500,000	
Hurdah to Jubbulpoor...		1,764,000	
Oomrawuttee to Nagpoor		774,000	
Sindh...	60,498	201,513	2,89,813
Indus Flotilla	2,317	88,300	
Punjab, Mooltan, and Umritsur	154,921	1,596,685	4,446,685
Ditto Umritsur to Delhi	... ...	2,850,000	
Bombay, Baroda, and Central India	(Overdrawn) 211,449	1,081,000	
Eastern Bengal (present works)	(At credit) 67,386	822,225	
Calcutta and South-Eastern	11,508	58,736	
Great Southern-of-India	22,465	231,709	
Total balances at credit ...	1,587,965	25,290,563	
Deduct balances overdrawn ...	226,829		
Balance ...	1,361,136		

The result, therefore, appeared to be that to the extent of upwards of £20,000,000 no provision had been made for the Capital required to complete the system of Indian

[*P. W. Dept.*] Railways beyond the power of borrowing £3,000,000, taken by the Secretary of State last year, and which, if exercised, would nearly be exhausted in replacing the balance in England, which had been expended in the current year.

In the uncertainty whether funds would be forthcoming for the vigorous prosecution of the several lines under construction, these lines were divided into two classes, one embracing those upon which the progress made had been such that the idea of suspending them could not be entertained unless upon the gravest emergency, the other those either not commenced, or upon which so little progress had been made that no serious loss would ensue from their suspension beyond that of the retardation of the benefits of Railway communication.

CLASS I.

Lines.	Estimated Capital in excess of that spent up to 15th November 1860, required to complete the several lines.
	£
East Indian—Main line from Calcutta to Delhi, with Singarrun Branch and Burrakur Extension (Raneegunge)	4,790,681
Madras—Main line from Madras to Beypoor and Bangalore Branch	559,964
Great Indian Peninsula—Bombay to Sholapoor	4,182,508
" " " to Bhosawul Junction ...	
" " Bhosawul to { Hurdah towards Jubbulpoor (?) / Oomrawuttee towards Nagpoor }	
Sindh Railway	201,513
Indus Flotilla	88,300
Punjab, Mooltan, and Umritsur	1,596,685
Bombay, Baroda and Central India—Bombay to Ahmedabad ...	1,081,000
Eastern Bengal (right bank of Ganges)	822,225
Calcutta and South-Eastern	58,736
Great Southern-of-India—Negapatam to Trichinopoly	231,709
Total ...	13,613,321

CLASS II.

Lines.	Estimated Capital in excess of that spent up to 15th November 1860, required to complete the several lines.
	£
East Indian—Jubbulpoor Line, Allahabad to Jubbulpoor	1,805,170
Madras—Bellary Line, Arconum Junction to Moodgul	2,984,072
Great Indian Peninsula—Sholapoor to Moodgul	1,500,000
" " Hurdah to Jubbulpoor	1,764,000
" " Oomrawuttee to Nagpoor (?)	774,000
Punjab—Umritsur to Delhi	2,850,000
Total ...	11,677,242

A reference was however made on the general subject to Her Majesty's Secretary of State, and under instructions received from the Home Government, it has been decided that the execution of none of these lines should be deferred, except the Jubbulpoor line of the East Indian Railway, the Madras North-West line beyond Cuddapa, and the Delhi and Umritsur line, on which no commencement has been made. [*P. W. Dept.*]

Railway accidents. Appendix J.

Annexed (Appendix) is a detailed Report with Statements, showing the number and nature of accidents that have occurred on all Railways in India during the year 1860.

Apportionment of certain expenses of a Railway partly open and partly under construction.

It has been decided by the Home Authorities that the home expenses and the general expenses of Railway Agencies in India shall be apportioned ratably between Capital and Revenue according to the total expenditure on each account.

Incidence of the cost of construction and maintenance of roads giving access to Railway Stations.

The following general principles have been laid down for the guidance of the Local Governments concerned, in deciding upon questions which may arise in connection with the construction and maintenance of roads giving access to Railway Stations :—

When a Railway Station is placed where it is not in communication with any road, the Railway Company are bound to connect it with the nearest road, and to keep the connecting portion of road in repair. But Railway Companies cannot be required to construct or keep in repair any thing more than these short roads, placing their Stations in communication with the road system of the country, be it convenient or inconvenient, good or bad.

Beyond these roads of access to Stations, the expense of all Railway feeders to be borne by Government; moreover, if such roads of access become part of the main communications of the country, the Railway Companies are entitled to look to Government to bear half the expense of maintenance.

Railway Officers to be consulted in reference to Railway feeders, but to have no power of deciding on works to be executed at the expense of Government. The procedure in regard to the construction of roads of access to be precisely the same as in regard to the construction of the Stations to which they lead.

Railway feeders and roads of access to Stations should be classed as Local or Imperial according to the principles on which other roads are so classed.

Examination and adjustment of Railway Revenue Accounts.

The important question of the measures to be taken for ensuring the proper examination and adjustment of the Revenue Accounts of Railway Companies, so far as Indian expenditure is concerned, was raised by the Government of Bengal.

[*P. W. Dept.*] There can be little doubt that a careful audit of the Books is wanted. The Consulting Engineer has the power, it is true, under the Railway Contract, to make an examination of the Railway Books; but not only has the exercise of that power been hitherto almost entirely held in abeyance, but it would be too much to expect, with reference to his onerous duties, that he should be the Auditor; nor indeed is it to be expected that that Officer or his deputies will always have abilities as Accountants sufficient to enable them to perform such a duty efficiently. The great importance and difficulty of such a duty as the audit of the complicated accounts of such large works, were not appreciated when first the Guaranteed Companies were formed, and have only gradually been brought to light. The difficulty would perhaps be best met by attaching an Accountant to the Consulting Engineer's Office as part of the regular staff for each Local Government. The matter is at present under consideration.

Consulting Engineers appointed ex-Officio Secretaries to Local Governments.

In connection with the changes in the administration of the Public Works Department, noticed in paras. 20 to 34 of the Report for 1859-60, it was thought desirable to constitute the Consulting Engineers to the Governments of Bengal, North-Western Provinces, and Punjab, ex-officio Secretaries to those Governments in the Railway Branch of the Public Works Department. By this arrangement much time and correspondence will be saved.

Training of Engine-Drivers, &c., in India.

In the Report for 1859-60 it was reported that the Lieutenant Governor of Bengal had expressed fears of a break down in the working of Indian Railways for want of a sufficient staff of Engine Drivers, and that the other Local Governments had been invited to favour the Government of India with an expression of their opinions on the subject of the best plan of maintaining one.

Replies have been received, both as regards Engine Drivers and skilled Mechanics generally. The Report by the Madras Railway Officers was full of interest, and the success which had attended their efforts to make available local labour, European, Eurasian, and Native in all Departments, was most gratifying; the number at present under training is 61, viz.:—

For Engine Drivers	20
Engine Fitters and Erectors	16
Boiler Smiths	5
Carriage Fitters	16
Carriage Examiners	4

These are composed of 32 Europeans, 25 East Indians, 1 West Indian, 2 Africans, and 1 American, besides 26 Apprentices, consisting of 6 Europeans and 20 East Indians, who, with one exception, have made creditable progress. Of these Apprentices, about 40 per cent. are brought up as Fitters and Erectors, 20 per cent. as Turners and

Machine-men, 20 per cent. as Boiler Smiths, 10 per cent. as Copper Smiths, and 10 per cent. as Moulders. [*P. W. Dept.*]

Seventy-five Natives are employed in the shops as Firemen, Engine Fitters, and in other branches of Locomotive work; the Stationary Engines at Rozapooram and Perambore are under the charge of Native Engine-men.

In the Traffic Department, with the exception of the Traffic Manager and his Assistant, each class of employés, Station Masters, Guards, Telegraph Inspectors and Signallers, &c., &c., have been engaged in this country, and the staff, as organized, works in a most satisfactory manner.

In the General Offices and the General Stores Department the practice has been to employ the people of the country, East Indians and Natives, with very few exceptions.

From the Report received from Bombay, it appears that 79 Europeans, 15 Eurasians, and 809 Natives, have been trained as Engine-men, Firemen, Fitters, Erectors, Turners, Machine-men, Smiths, Carpenters, &c., &c., &c., besides 163 Apprentices at present in training as Fitters, Carriage Builders, Smiths, &c., of whom 3 are Europeans, 9 Eurasians, and 151 Natives; the Machine-men and Turners are all Natives, and their Foreman is an Eurasian.

In Bengal the system of training men commenced so long ago as 1855, and since that period 65 men engaged in this country as labourers had been promoted to Engine-men; of this number 45 are now running regular Trains, 75 Firemen are in training, who may be expected to be ready for promotion to Engine-men, say in 12 or 18 months.

All Stationary and Pumping Engines (20 in number) have been driven by Natives since 1856 without a single accident from neglect.

In connection with this subject it has lately been recommended to the Home Government that the Locomotive Department in Bengal should have a bonus of Rs. 10,000 as a premium for past success, and that in future a premium of Rs. 250 should be assigned for every approved Engine Driver trained by them. The number of premiums to be limited by confining them to cases of men who actually receive permanent employment as Drivers on their own or another line. It has also been recommended that if one Railway Company supplies another with Drivers of its own training, a bonus of Rs. 300 should be paid, the additional Rs. 50 going to the Locomotive Superintendent.

Land for dwelling houses for Railway Officers.

On a reference from the Madras Government, it was ruled that *dwelling houses* for Engine Drivers or Station Masters, and still less for general workmen, were not to be considered as "conveniences," for which, under the terms of the contract, the Government were obliged to provide land. The Local Governments and Administrations have been advised to this effect.

[*P. W. Dept.*] Appended to the Report for 1858-59 were certain rules which it was found necessary to lay down for general observance in the matter of lands taken up for Railway purposes. They have since been amended in some particulars, and the rules, as finally approved by Her Majesty's Secretary of State, are printed in the Appendix.

Amended rules for taking up lands for Railway purposes. Appendix K.

At the instance of the Government of the North-Western Provinces, the following rules regarding Sunday labour on Railways have been circulated to the Local Governments for guidance :—

Sunday labour on Railways.

I. Work of every kind to be performed by contract or otherwise on Railways, and other works under construction by Companies working under Government guarantee, will cease on Sundays, except in the following cases :—

In cases of absolute necessity,* certified to the satisfaction of the Local Governments.

* The Officer in immediate Executive charge to be held a sufficient judge of what may be a case of emergency.

In cases in which the work is to be carried on at a distance from any European Station, and does not require daily supervision by Christian Overseers.

In cases of existing contracts, under which it has heretofore been carried on in the belief that the clause of the contract prohibiting it would not be enforced.

II. In entering into new contracts it is to be distinctly explained that the above rule will be strictly acted up to.

In 1856 a Memorandum of certain dimensions for fixed and moving structures for Railways was agreed upon and sanctioned by the late Court of Directors for the use of all Railways in India, and in illustration of those orders the Secretary of the East Indian Railway Company forwarded to the Agent in India a tracing purporting to be a Standard Loading and Bridge Gauge. But many discrepancies were found to exist between these dimensions and those proposed for the Eastern Bengal Railway, and a Meeting was called of the Chief Engineers of the Railway Companies in Calcutta, the Locomotive Superintendent of the East Indian Railway Company, and the Architect of the Eastern Bengal Railway Company, and in consultation with those gentlemen diagrams were prepared and circulated to the several Railway Companies in India for their opinion.

Uniform standard dimensions for fixed and moving structures for Railways throughout India.

About the end of the year 1856 some kyanized sleepers were laid in a canal siding at Madras. A Report has been received, from which it appears that they are all in excellent condition, even the sap wood remaining firm and good. In Bengal and Bombay saul wood is found

Report on kyanized sleepers.

to be of great durability; the perfect condition of the heart wood of the canal siding sleepers is therefore probably no test of the value of the kyanizing process, but the sound condition of the sap wood, after a test of about three and a half years, must be held to prove that the process has had a certain efficacy; the cost, however, of the process (Rs. 1-1 per sleeper) presents a serious objection to its adoption. [*P. W. Dept.*]

RAILWAY, BENGAL.

Opening of the East Indian Railway to Rajmahal.

The East Indian Railway line to Rajmahal was opened on the 15th October 1860.

A Train, containing the Lieutenant Governor of Bengal and other guests invited by Mr. Palmer, the Agent, East Indian Railway Company, started from Howrah at ½ past 8 o'clock in the morning, and took up the Right Hon'ble the Governor General and His Excellency the Commander-in-Chief at Serampoor at 9 o'clock. The Train entered upon the new line at Synthia at about ½ past 12, and after stopping for the refreshment of the passengers for nearly an hour at Rampoor Haut, reached Rajmahal by a ¼ before 5 o'clock in the evening. The distance of Rajmahal from Howrah is 202 miles, of which 83 are newly opened.

The party returned without any untoward occurrence to Calcutta on the following day.

It was no small achievement to open 83 miles of Railway in one day, and to run successfully a Train consisting entirely of new carriages built in the Railway Company's own Workshops, conveying upwards of 200 1st Class passengers over 200 miles of Railway at an average speed of 25 miles an hour, returning the same distance with equal success the next day.

The line had, as was to be expected, suffered much from slips and settlement of the new embankment during the rains, then hardly over, and the ballasting was incomplete; but the Engineers had exerted themselves to get ready for an opening before the Doorgah Poojah Holidays, and succeeded so well that the Train passed up without difficulty or delay, except for five or six minutes to replace a rail near the commencement of the Rajmahal Branch.

The opening of the East Indian Railway to Rajmahal being a memorable point attained in the construction of that great work, a Medal has been struck by the Government of India in commemoration of the event. The distribution of a symbol of the kind would, it was thought, be acceptable to the Engineers and others, whose services in connection with the work it was proper to acknowledge, and it will doubtless tend much to the promotion of good feeling on their part. It is probable, moreover, that the remaining sections of the Railway will be opened in comparatively small portions, and till the whole line is finished, there will be no event of equal importance as a land-mark in the history of the enterprise.

[*P. W. Dept.*] His Excellency the Governor General, in proceeding up the Ganges at the close of the past year, took the opportunity of visiting three of the principal works on the East Indian Railway, viz., the Monghyr Tunnel, and the Soane and Kurrumnassa Bridges.

Monghyr Tunnel, Soane Bridge, and Kurrumnassa Bridge.

Monghyr Tunnel.—The length of the Tunnel is 900 feet. The actual tunnelling was commenced by the Contractors in March 1856, but they soon gave it up, and the work has been continued by the Railway Company's Engineers. The work has not been one of difficulty, such as to call forth the exercise of skill on the part of the Engineers, but one of extreme laboriousness, owing to the exceeding hardness of the quartz. The careful organization of the labour, the skill which the miners have acquired from long experience, and the almost total freedom from accident during the long continued blasting operations, attest the ability with which the work has been superintended by Mr. Harris, the Resident Engineer.

But while all praise is due to those concerned in the execution of the work, it is very doubtful whether it was at all necessary to undertake it. At first it was not intended to connect the Railway with the Ganges by a branch line; and under such circumstances, and while the arduous nature of the work had not been ascertained by experience, it was thought worth while to construct the Tunnel in order to save three miles of distance between Calcutta and Delhi. Since the branch line of 5¼ miles to the Ganges has been undertaken, there is no saving in length of line to be constructed, and the expense and delay occasioned by this Tunnel are clearly not at all commensurate with the small advantage of a reduction of three miles in the distance to be run by through Trains.

The portion of the hard quartz rock remaining to be pierced in December 1860, though less than 250 feet in length, will, it is expected, take yet eight months to remove; and the entire cost of the Tunnel and its approaches when finished will, it is believed, be not less than six lakhs of Rupees.

Soane Bridge.—His Excellency was much struck with the magnitude of the works of this bridge. It is to consist of 27 iron lattice spans, each of 150 feet. Including the abutments, the works extend over nearly a mile, and along the whole length work is in progress in various stages. Two of the iron spans had been erected, one at each end, and the rivetting of these was being finished at the time of His Excellency's visit. Staging was up for two more spans, and the iron-work was being raised. Staging was being put up for two other spans. For the whole intermediate space, the sinking of the foundations was in progress. Each pier is to stand on three wells of 18 feet diameter. The wells of all the piers had been sunk through 30 feet of sand to the stratum of clay, which exists at that depth. They were being worked into the clay.

The completion of the entire work may be hoped for in two full years from the time of the Governor General's visit, if everything goes on successfully. The tediousness of the process of sinking the wells is the cause of no more rapid progress being expected. The time required for erecting the iron-work does not exceed six weeks for each span,

and several could be put up at one time, if the piers were ready to receive them. [*P. W. Dept.*] The cost of the bridge when complete will be about 35 lakhs of Rupees.

Every thing bore evidence of active progress and efficient management, and reflected much credit on the Engineers, Messrs. Power and Schmidt.

Kurrumnassa Bridge.—This bridge is to consist of 13 arches of 40 feet span, and at the time of His Excellency's visit, it was built up to the springing of the arches.

His Excellency noticed with much pleasure the good management and right spirit that pervades the dealings of the Officers of the East Indian Railway Company with the Native population. Differences between the Officers and the Natives employed by them are almost unheard of. Labourers come in freely to seek work, even from the wild Sonthal Hills, and no impediment being offered to their return to their homes whenever the fancy seizes them, they work well and cheerfully. No signs of unwillingness on the one side, or of attempted constraint on the other, had reached any of the Magistrates or other Civil Officers of whom enquiry was made.

It is deserving of notice that amongst the workmen on the Soane Bridge many were observed who evidently had been Sepoys. Several of these had openly received their discharge from the Army, but there were others who had probably slunk back to their homes unobserved. They were spoken of by the Engineers as useful well-behaved men, and as being those from whom the Police of the works and petty Officers were mostly chosen. This employment of a class who are not generally willing to take to field labour in their own villages, had doubtless contributed to the thoroughly peaceful condition which prevails throughout Behar.

Land for E. I. Railway Coal Depôt approaches at Rajmahal.

In consequence of the deep water channel of the Ganges having receded from the river bank at the Station of Rajmahal from about 1½ miles down-stream, where the coal depôts are, and where the storage depôts must also be placed, it was found necessary to take up the whole of the land forming the river frontage from the Government land to the depôts. A portion of the land has been made over to the Railway Company for the purpose of laying down a double line of rails to connect their terminus and depôts, and the remaining portion has been parcelled out for coal and store depôts for private Companies.

RAILWAY, N. W. PROVINCES.

Course of the Jubbulpoor Line. Postponement of work.

The general course of this line depends upon the point selected for the ascent to the table-land of Rewa. That point being determined, the direction of the line as far as the Town of Myhere follows, and from Myhere to Jubbulpoor its course may be said to be determined by nature. The preliminary surveys of 1856 showed that an ascent very superior to any before tried was to be had by the Chetara Ghat, nearly north of Myhere. This, however, involved a circuit, and Mr. LeMessurier, the Company's

[*P. W. Dept.*] Chief Engineer, therefore tried again for a more easterly ascent near the Tonse. He failed in finding tolerable gradients, and the Chetara Ghat must be adopted. Even this renders it impossible to keep the ruling gradient of the line very low, though the ascent is far superior to that of others to the table-land of Central India. The gradient is 1 in 200 for 8½ miles, but is never worse than this. Bridges of all sizes too are numerous.

The whole length of the line is 223 miles, and the Estimate, excluding contingencies and staff, and also excluding any allowance for profits of Contractors, is Rs. 1,73,79,084, or about £8,000 per mile.

It has, however, been determined by Her Majesty's Government, in communication with the Directors of the East Indian Railway Company, to postpone the execution of this branch until the North-West Line has approached more nearly towards completion.

Agra Terminal Station Buildings.

An Indent, amounting to Rs. 2,02,216-15-9, was laid before the Government for the Terminal Station buildings at Agra, but the amount of accommodation seemed unnecessarily large, and an amended design has been called for. There would be neither wisdom nor economy in erecting such large solid structures as those proposed, until the traffic shall be in some degree developed. In regard to the general arrangement of the buildings, some points of difference, chiefly of a professional nature, arose between the Consulting and Chief Engineers, but general sanction was accorded to the arrangements, on the understanding that the Consulting Engineer could come to an agreement with the Chief Engineer on some minor points connected with the plans.

Proposal to dispense with the south span of the Jumna Bridge at Allahabad.

This bridge was designed for 15 spans of 200 feet each, but further observation of the nature and direction of the floods led the Chief Engineer of the Railway to the conclusion that one span at the southern end might safely be dispensed with. The highest flood scarcely ever touches the ground between the abutment and pier No. 1, and after deducting this span and the sectional area of the piers, the bridge site still leaves a sufficient area of water-way for the highest flood. The saving to be effected by dispensing with this span is estimated at Rs. 1,87,360. The proposal has been sanctioned.

Taking up of land in the City of Delhi to meet the requirements of the East Indian and Punjab Railways.

Under the arrangements sanctioned, the East Indian Railway will pass through Selimghur and enter the City of Delhi close by the north corner of the Palace, and immediately to the north of the Calcutta Gate, while the Punjab Railway will enter the City in the opposite direction north of the Cabool Gate.

Although the construction of the Punjab line to Delhi has been deferred, it has been thought advisable for more than one reason to secure at once an ample provision of land for both Railways.

It may be added that it is intended that the Stations of the two Railway Stations shall be distinct, but contiguous with one continuous platform. They will in fact form apparently one building fronting the centre of the Royal Garden. It has also been resolved, both on the score of public convenience and of economy, to exclude the Locomotive arrangements from the City, as land suitable for the purpose can be obtained in the immediate neighbourhood. [*P. W. Dept.*]

RAILWAY, OUDH AND ROHILKUND.

Oudh and Rohilkund Railway Surveys.

The surveys made by the Engineers of the Oudh Railway Company and by Mr. Hardy Wells on behalf of Government for the Railways which it has been proposed to construct in the Provinces of Oudh and Rohilkund, are now before the Government.

Proposed Railway between Lucknow and Cawnpoor.

The Chief Commissioner of Oudh forwarded to this Government the proceedings of a Meeting of the European and Native inhabitants of the City of Lucknow, held on the 29th instant, for the purpose of taking further measures for promoting the project of a Railway between Lucknow and Cawnpoor.

The following resolutions of the Meeting, with the remarks and decisions of the Government on each, will show what has been done in the matter :—

"I.—That the Capital be 50 lakhs of Rupees in 20,000 shares of Rs. 250 each."

The Capital is considered sufficient.

"II.—That when the Capital is subscribed, 25 per cent. thereof shall be deposited in the Government Treasury, and that Government be requested to allow interest at the rate of 5 per cent. on it, or on whatever balance of it may at any time be in the Treasury."

Assented to. The deposit of 25 per cent. of the Capital (12½ lakhs of Rupees) to be considered an essential condition of the concessions requested from Government.

"III.—That Government be applied to for a free grant of land for a double line of Railway, on the same terms as land has been granted to the East Indian Railway Company."

Also assented to under conditions of resumption in case of failure to complete the line, or to work it when completed. The Company to agree to stipulations regarding the carriage of mails and troops, &c., and to other conditions enunciated by the late Court of Directors on the subject of Unguaranteed Companies, or to at least such of those conditions as the Government might desire to exact when the scheme had taken a more advanced form.

"IV.—That Government should be asked to grant protection against competition for 99 years."

[*P. W. Dept.*] The Government were willing to grant protection for the period required against direct competition, i. e., against any other direct line from Cawnpoor to Lucknow, but not, of course, against indirect competition, such as that of a line from Fyzabad or Benares.

"V.—That Government should be asked to grant the services of an experienced Officer to aid generally in the construction of the line."

The Government were willing to promise the services of an experinced Officer to be associated with the management and endowed with some special functions of audit. Much importance was attached to the exercise of these functions as a means of bringing promptly to the notice of the shareholders generally the facts regarding the expenditure of their Capital.

"VI.—That Government be requested to provide, as soon as possible, metalled roads on the main lines of Oudh, which would serve as feeders."

The Government has this subject much at heart, and it has not been disregarded.

"VII.—That the Government should be asked to place at the disposal of the Committee any Surveys and Estimates which may be in their possession."

Assented to. The Chief Commissioner of Oudh was advised that all pecuniary liability for land or otherwise on the part of Government was to be carefully eschewed, until the scheme has taken a much more advanced shape than at present.

Railway from Baroda to Dubhoee.

His Highness the Guicowar proposed to construct a branch line connecting the Bombay, Baroda and Central India Railway Company's main line with the Towns of Dubhoee and Bhadoorpoor in His Highness's Territory.

The object with which this proposal was made was two-fold; first, to open the cotton country about Dubhoee to the Port of Broach, and second, to bring that country into certain and easy communication with Baroda, the direct road being almost impassable in the rains.

His Highness wished to stand in the same position to the proposed line as the British Government stands with respect to the main lines of communication in India, viz., giving a 5 per cent. guarantee, providing the land, &c.; adopting in short all the terms of the contract concluded by the British Government with the Railway Company. The only conditions asked for by the Guicowar's Durbar were, that the contract for constructing and working the line should be given to the Bombay, Baroda and Central India Railway Company, and that a guarantee should be given by the Government that no competing line would be sanctioned by the Government; the former condition was allowed, but the latter was subsequently withdrawn, on its being pointed out that no Railroad could be carried through his Territory without His Highness's permission.

The survey of the line had been sanctioned, but was afterwards postponed by the Guicowar; this is to be regretted, as the undertaking promised many advantages.

LIST OF THE PRINCIPAL ORIGINAL WORKS INCLUDED IN THE FOREGOING RETURN.

Nature of Works.	Estimated Cost.	Expended up to 30th April 1860.	Sanctioned for 1860-61.
MADRAS.	Rs.	Rs.	Rs.
Military ... Alterations and repairs to the Fortifications of Fort St. George ...	4,98,092	1,77,771	1,33,132
" Barrack Accommodation at Bellary ...	2,20,054	71,424	52,577
" at St. Thomas's Mount ...	1,00,000	14,331	4,929
" at Fort St. George ...	1,39,150	19,000	15,344
" at Bangalore ...	10,00,710	3,52,106	1,48,700
" at Jackatalla ...	10,00,720	10,43,219	1,07,346
Improving the Drainage of Fort St. George ...	70,000	10,097	19,344
Judicial ... Judicial Buildings at Salem ...	1,18,076	40,000	52,670
General ... New Wing to General Hospital, Madras ...	90,300	...	60,200
Engineer's Store Yard for Machinery, &c., at Madras ...	72,500	...	45,320
Agricultural ... Additional Lock and Calingulah in the Nizampatam Channel, Krishna ...	24,600	...	24,600
Converting the Sarrapilli Channel with Jaffer Sahib's Channel, Nellore ...	50,000	...	48,500
High level Channel from the Bodavaie to Portlevel and thence to Dendaloor, Krishna ...	63,895	63,653	60,000
Channel from Pulicote near Wyrur to the Canal Basin, Krishna ...	1,87,507	1,18,511	60,000
Rectifying the Anicut across the Penner at Nellore ...	1,21,503	57,645	55,312
Deepening, &c., Purrakey Channels in Trichinopoly ...	50,000	4,735	15,500
Communications ... Metalled Roads in Ganjam ...	97,859	48,823	8,47,350
from Berahampatam to Nuzzea Frontier Kistna ...	1,570	8,000	20,000
" in North Arcot ...	1,00,000	50,243	20,540
" in Trichinopoly ...	1,00,000	87,091	15,000
" in Madura ...	1,00,000	...	19,350
" in Coimbatore ...	1,00,000	2,500	20,120
" in North Canara ...	1,00,000	44,847	20,000
" in Malabar ...	1,00,000	12,000	19,205
from Karnool to Nundiall ...	1,00,000	1,04,888	2,500
" to Kodoor ...	1,00,000	...	1,00,000
" to Dooty ...	1,00,000	...	1,00,000
Completing the Nundiconna Ghat, Karnool ...	1,00,000	25,000	13,000
Unmetalled Road in Cuddapah ...	1,00,000	4,500	25,000
" in Malabar ...	1,00,000	17,000	17,000
Bridge on Trunk Road No. 6, Nellore ...	1,00,000	1,216	9,700
" in North Arcot ...	1,00,000	903	11,755
" in Madura ...	1,00,000	1,000	1,000
" in Malabar ...	1,00,000	1,000	1,000
Completing the Nonconpan Lock, Godavery ...	1,00,000	13,000	10,000
Minor works not enumerated ...	1,00,000	1,45,753	2,55,760
Total ...			10,35,551
BOMBAY.			
Military ... Harbour defences, Bombay ...	10,00,000	...	1,50,000
Barrack Accommodation at Belgaum ...	1,00,000	21,919	55,291
" at Wanowrie ...	4,70,000	3,33,395	1,22,903
" at Ahmednuggur ...	2,00,000	1,44,331	55,669
" at Candeish ...	1,00,000	23,146	19,000
" at Mhow ...	3,00,000	1,22,000	1,07,000
Temporary " at Ahmednuggur ...	20,000	12,126	8,000
Fabrication at Mazagon ...	1,00,000	45,000	55,000
Temporary Barracks at " ...	20,000	2,125	17,150
Barrack Accommodation at Neemuch ...	1,41,171	9,068	85,764
" at Asim ...	4,46,000	1,67,175	77,691
" at Shikarpoor ...	3,00,000	23,714	57,295
Additions and alterations to Belgaum Arsenal ...	30,000	24,954	10,857
Ordnance Buildings, Bombay ...	2,10,000	72,575	57,000
New Graving Dock, " ...	4,50,000	1,000	1,000
Works in the Bombay Dock Yard ...	1,50,000	68,455	50,000
Judicial Jail at Ajmere ...	30,000	14,925	15,704
Municipal Clearing out and repairing Tanks in Tivelly Valley, Aden ...	1,62,870	1,62,870	50,000
Marine Improvements to the Karrachee Harbour ...	13,70,000	40,000	2,50,000
Agricultural Enlargement of the Baggage Canal ...	54,778	...	52,778
Mirror Canal (in Sind) ...	1,45,000	...	1,00,000
Improving Bunders in Candeish ...	80,000	25,429	40,000
Communications Agra and Bombay Road from Mhow to Deesa Boundary ...	8,10,000	...	1,00,000
Road over the Phoonda Ghat ...	1,37,725	81,070	20,000
" in Candeish ...	2,00,000	2,10,925	60,000
Bridges on the Hyderabad and Shahapoor Road ...	40,000	...	20,000
Road over the Larkee Pass, Karrachee ...	70,000	22,674	17,326
" from Deesa Boundary to Deesa ...	1,00,000	14,000	60,000
" from Gogo to Ahmedabad ...	1,90,000	1,07,623	50,000
Temporary Repairs, Mhow to Sirdars Ghat ...	90,000	90,859	60,000
Minor works not enumerated ...	1,03,614	87,444	1,01,614
Total ...			16,05,917
BENGAL.			
Military ... Sanitary Cells at Barrackpore ...	40,000	...	39,000
Barrack Accommodation at Berhampore ...	60,000	47,000	63,000
" at Dinapore ...	...	1,50,000	50,000
Buildings for a Co. of Artizan Batts., Belgaum ...	28,000	20,000	8,000
Additions, &c., to Arsenal, Fort William ...	86,000	52,377	13,018
Barrack Accommodation, Sitta ...	55,000	55,198	9,813
Store Store Shed, Sitta ...	37,000	...	37,000
Minor works in Fort William ...	70,000	40,000	30,000
Naval Land required for extension of the Dock Yard and Works and for the diversion of the Garden Reach Road ...	2,50,000	...	2,50,000
Judicial Magistrate's Cutcherry at Patna ...	30,000	23,000	20,000
Jail Buildings at Dehrooghur ...	50,000	32,000	1,000
" at Sasseram ...	50,000	32,000	5,000
Revenue Collector's Cutcherry at Shergotypoor ...	25,000	23,000	10,000
New Export Wharf Shed at Calcutta ...	85,000	85,000	9,750
New Opium Godown at Sitta ...	1,50,000	50,000	1,30,000
Additions, &c., to Opium Buildings at Goolzarbagh ...	35,000	32,000	3,000
Ecclesiastical ... Temporary Church of Iron frames at Barrackpore ...	28,000	25,000	23,000
Educational ... New College with Out-offices at Berhampore ...	70,000	8,000	62,000
General New Copper Mint ...	...	...	1,50,000
Agricultural ... Embankments between the Hollee and Roodapore Rivers ...	60,000	47,000	5,000
Bangh mote Gooptee at Nuzzi ...	51,000	40,000	12,000
Communications ... Road from Calcutta to Jessore ...	1,20,000	...	51,000
Metalling a portion of the Road between Calcutta and Midnapore ...	60,000	...	60,000
Jungypoo and Nullachie Road ...	80,000	30,000	15,000
Nuzzee and Shergotypoor Road ...	1,50,000	60,000	10,000
Dalpoolie and Cawapoor Road ...	1,50,000	80,000	15,000
Hanswahgh and Burhee Road ...	60,000	15,000	10,000
Tetuldoorah and Kulsee Ghat Road ...	70,000	15,000	12,000
Beerapoor and Mutlah Road ...	1,20,000	15,000	10,000
Bridge over the Burrakur River ...	1,17,000	1,10,000	10,000
" over the Gunduckoa River ...	90,000	45,000	8,000
Carried over ...			14,17,326

Nature of Works.	Estimated Cost.	Expended up to 30th April 1860.	Sanctioned for 1860-61.
BENGAL—*Continued.*	Rs.	Rs.	Rs.
Brought forward ...			14,17,326
Shergotty Bridge ...	5,50,855	1,85,285	50,000
Masonry Causeway across the sandy bed of the Soane ...	50,000	10,378	14,000
Two Masonry Viaducts for the Dumpooter Bridge ...	80,000	62,000	4,000
Minor works not enumerated ...	8,93,301	5,17,303	4,23,000
Total ...			19,44,326
N. W. PROVINCES.			
Military ... Wash-houses for European Troops at Meerut ...	68,184	...	58,184
" Cantonment Roads at Cawnpore ...	23,912	13,000	12,000
Barrack Accommodation at Cawnpore ...	9,00,000	8,90,000	10,000
" at Gwaliore ...	...	...	30,000
" at Bareilly ...	7,00,000	1,56,000	1,30,000
" at Shahjehanpore ...	3,50,000	1,37,967	47,918
" at Jhansi ...	7,00,000	1,50,000	1,00,000
" at Lohurpoor ...	1,25,000	68,000	30,000
" at Gwaliore ...	3,50,000	2,50,000	2,00,000
" at Oorai ...	3,50,000	3,50,000	75,000
" at Mooltan ...	3,50,000	30,722	60,278
" at Jubbulpoor ...	...	88,549	75,000
" at Sangor ...	23,000	23,000	21,337
Ordnance Buildings at Allahabad ...	23,640	8,500	15,000
Judicial ... Magistrate's Cutcherry at Mottra ...	25,000	10,000	15,000
Revenue ... Customs Bungalows at Jhansi ...	30,000	...	15,000
" at Soosa ...	30,944	...	15,000
" at Allahabad ...	25,913	...	10,000
General ... Civil Offices at Allahabad ...	...	...	50,000
Memorial Garden at Cawnpore ...	...	...	50,000
Advance for Work-shops at Roorkee ...	...	...	50,000
Allahabad Civil Station (since reduced to Rs. 50,000) ...	...	...	1,00,000
Industrial ... Kamaon Iron Works (since transferred to a Company) ...	...	...	1,44,000
Agricultural ... Futtehghur Branch of the Ganges Canal ...	13,01,998	4,45,541	1,50,000
Improvement of the Kamaon Valleys ...	1,11,500	...	1,00,000
Rajbahas on the Ganges Canal ...	...	4,59,162	4,59,162
Works on the main line, Ganges Canal (lower portion of Solani Earthen Aqueduct) ...	1,88,84,873	42,74,966	1,00,000
Mangrar Gardens on Canal banks ...	1,00,000	1,000	4,000
Jakhan Canal, Dyrah Dhoon ...	50,051	34,000	10,000
Kyla Canal, Rohilcund ...	86,478	37,473	10,000
Minor works not enumerated ...	1,00,000	1,00,000	1,00,000
Total ...			20,00,000
Communications ... Bridges on the Agra and Gwalior Road ...	30,741	...	30,000
Mound and Revêtee ...	...	30,000	30,000
Bowar and Futtehghur ...	23,400	23,000	23,000
Agra and Bombay Road in Gwalior Territory ...	14,00,121	...	1,50,000
" between 18th and 19th Milestones ...	...	19,000	22,000
Jubbulpore and Kullanjore Road ...	33,850	30,000	30,000
Great Deccan Road from Nuthoolla to near Kampteo ...	6,70,000	40,331	30,000
1st Division, Great Deccan Road ...	20,476	15,000	17,863
Bridge over the Bheema at Salgaon's ...	34,618	...	20,000
Edu. Telegraph Bridge Telegraph College at Roorkee, Allahabad, and Cawnpore ...	52,000	...	52,000
Minor works not enumerated ...	5,24,000	49,152	4,03,078
Total ...			20,00,240
PUNJAB.			
Military ... Mounting Guns on the Lahore and Cashmere Gate at Delhi ...	33,945	...	20,000
Defences at Attock ...	43,513	19,800	1,00,000
Kohat Fort Works ...	4,00,000	2,23,579	14,375
Barrack Accommodation at Rawul Pindee ...	7,51,000	1,62,750	75,000
Infantry Hospital at Mooltan ...	1,24,113	15,945	20,000
Subsidiary Buildings to Barracks at Noun Mair ...	50,000	12,145	25,000
Umritsur Infantry Hospital ...	34,000	...	20,000
Trans-Sutlej Barracks at Ferozepoor ...	4,00,000	1,19,246	45,146
Barrack and Subsidiary Buildings at Umballa ...	85,000	31,746	20,945
Revenue ... Improvements to Khewra Salt Mines ...	1,00,467	19,981	14,646
Ecclesiastical ... Churches at Peshawur and Umballa ...	47,000	8,000	8,000
" 11 Churches at different Stations ...	1,50,000	1,05,000	52,500
Educational ... Normal School Buildings at Sreenuggur ...	25,000	17,000	15,000
General ... New Mills at Mooltanpur ...	70,810	41,500	17,310
Agricultural ... Construction of Main Line and Branches, Bunn Doab Canal* ...	1,30,00,491	1,00,45,785	8,37,710
" Construction of Rajbahas* ...	17,45,000	14,018	3,00,000
" Improving and extending Upper Sutlej Canals ...	3,67,582	1,78,847	1,00,000
Communications Lahore and Ferozepore Road ...	1,37,421	...	42,764
" Peshawur ...	1,50,00,000	12,84,135	5,00,000
Sutlej and Bias Road ...	...	1,00,000	1,00,000
Bridges in the 7th Division, G. T. Road ...	...	...	1,75,000
" 8th " ...	...	...	1,75,000
Minor works not enumerated ...	4,00,653	39,050	3,21,779
Total ...	...	...	34,79,656
OUDH.			
Military ... Something the demolitions round the Fort at Lucknow ...	1,83,910	...	72,910
Barrack Accommodation at Cawnpore ...	...	...	50,000
" at Gwalior ...	68,110	...	50,000
" at Roy Bareilly ...	...	...	50,000
" at Fyzabad ...	98,976	...	50,000
Powder Magazine, Lucknow ...	58,000	...	58,000
Barrack Accommodation at Lucknow ...	21,00,000	20,96,511	3,489
" at Roy Bareilly ...	10,62,028	4,60,313	...
" at Sonapoor ...	10,54,100	4,99,228	15,39,271
" at Fyzabad ...	10,67,628	2,23,026	...
" at Gondah ...	4,90,981	1,93,499	...
Judicial ... Central and Divisional Jails ...	1,86,119	...	75,000
Ecclesiastical ... Protestant Churches at 7 Stations ...	73,835	21,941	18,931
" Roman Catholic Chapels at Lucknow and Roy Bareilly ...	58,784	...	24,750
Communications ... Allahabad and Fyzabad Road ...	1,20,000	...	40,000
Minor works not enumerated ...	27,400	4,000	27,400
Total ...			20,98,991
NAGPOOR.			
Military ... Accommodation for European Infantry and Vad Artillery at Kamptee ...	1,23,193	...	73,193
Female Hospital for European Infantry at ditto ...	23,000	...	15,000
Public Prisons in the Cantonments at Kamptee ...	23,000	...	23,000
Judicial ... Deputy Commissioner's Cutcherry at Chanda ...	23,000	...	6,000
" with Out-offices at Bramhore ...	27,000	...	27,000
Ecclesiastical ... Church at Seetabuldee ...	10,044	...	5,044
Communications ... Great Deccan Road Line 100 miles ...	...	...	10,000
Nagpoor and Bhandara Roads 117 miles ...	...	...	12,000
Minor works not enumerated ...	...	...	30,000
Total ...			2,25,419

Nature of Works.	Estimated Cost.	Expended up to 30th April 1860.	Sanctioned for 1860-61.
PEGU.	Rs.	Rs.	Rs.
Military ... Bassein Redoubt ...	24,500	...	7,500
" Tenasserim ...	1,85,582	...	50,000
" Private for N. I. and Camp Followers at Tenasserim ...	10,117	...	8,000
" European Infantry Canteen at Thayet Myo ...	10,819	...	14,819
" 3 Cook-houses for European Infantry and Artillery at Thayet Myo ...	17,554	...	12,555
" Commissariat Depôt at Thayet Myo ...	73,809	...	33,000
" Powder Magazine at " ...	30,000	...	15,324
" Ordnance Godown at " ...	17,000	...	15,000
" Tenasserim Powder Magazine ...	41,502	...	2,000
" Rangoon Arsenal General Store ...	61,800	...	61,800
" " Forge and Carpenters' Shop ...	11,945	...	11,945
General ... Algnada Reef Lighthouse ...	4,64,388	...	2,00,000
Municipal ... Rangoon Market ...	30,471	...	10,000
Marine ... Coal Wharf, Dalla Dock Yard ...	10,362	...	5,174
Minor works not enumerated ...	...	...	2,59,667
Total ...			6,40,790
T. AND M. PROVINCES.			
Military ... Police Barracks ...	...	...	25,000
" Huts for Police Battalion at Shwey Gyeen ...	10,503	10,000	6,261
" Commissariat Wharf at Maulmain ...	27,818	...	10,000
Judicial ... Court-house at Maulmain ...	63,156	12,500	6,000
Minor works not enumerated ...	59,725	6,411	45,058
Total ...	...	...	91,059
STRAITS SETTLEMENTS.			
Military ... Accommodation for European Troops at Singapore ...	6,93,157	...	5,80,000
Cook-room for N. I. Barracks at Singapore ...	10,239	10,139	100
Stock Magazine in Government Hill ...	12,100	4,400	7,700
Judicial ... New Inspector's Quarters and Coroner's room at Singapore ...	10,238	...	10,238
Additional Lock-up at Singapore ...	21,703	...	21,703
Converting the present Government House at Singapore into a Court-house ...	10,561	...	10,561
H. M.'s Jail and House of Correction ...	52,317	4,817	17,500
Combined Convict Lines ...	19,903	10,516	2,000
Police Thannahs opposite the Convict Jail ...	31,538	3,800	5,538
Three Police Stations ...	13,817	2,667	10,787
Total ...	...	...	6,75,626
General ... New Dispensary General Hospital ...	13,765	11,000	1,765
Lunatic Asylum ...	20,935	17,700	3,235
Marine ... New Lighthouse at Cape Rachado ...	54,951	...	11,932
Minor works not enumerated ...	...	...	69,591
Total ...	...	...	3,44,258
HYDERABAD.			
Military ... Barrack Accommodation at Trimulgherry ...	...	...	3,60,000
" Temporary Family Quarters at Secunderabad ...	52,500	52,500	1,000
" School-room with School Masters' Quarters at Trimulgherry ...	10,067	10,067	12,000
Communications 1st Class Road, between Tuba and Aurungabad ...	1,84,000	...	10,000
Road between Sarangaon and the Godavery River ...	12,852	10,252	1,000
Nagpoor Dawk Line between Tuba and Sarangaon ...	22,772	14,772	8,000
Minor works not enumerated ...	11,651	8,851	11,250
Total ...	...	...	3,95,250
COORG.			
Communications ... 2nd Class Road from Soontoorpett to Cooliypett, 46 miles ...	20,000	...	10,000
Minor works not enumerated ...	4,000	1,000	3,000
Total ...	...	...	13,000
HYDERABAD ASSIGNED DISTRICTS.			
Judicial ... Thannah and Chowkies ...	...	...	10,000
" Central Jail at Dharwar ...	...	...	25,000
Revenue ... Tahsildarees ...	...	...	5,000
" 4 Cutcherry Out-offices ...	3,000	...	3,000
" Commissioner's Cutcherry at Dharwar ...	15,000	...	5,000
" " at Goorsuntty ...	30,000	23,000	5,000
" Deputy Comm'r.'s " at Ashtoke ...	23,000	15,000	11,000
" " " at Dharwar ...	42,046	40,046	2,000
" " " at Lingsoogoor ...	42,000	30,000	5,000
Minor works not enumerated ...	...	...	65,945
Total ...	...	...	1,39,945
MYSORE.			
Revenue ... Taluk Cutcherries at Turrikeery and Chickmaglioor ...	11,800	8,500	3,300
Agricultural ... Drainage of Bangalore ...	74,800	...	74,800
Restoration of a Dam across the River Nagoo, Nuggur ...	...	...	1,00,000
Masoorpore ...	11,000	6,000	5,000
Minor works not enumerated ...	...	...	1,44,000
Total ...	...	...	3,10,000

* Under the Governor General's order lately published in the Supplement of the Calcutta Gazette, a much larger expenditure has now been decreed to the Rajbahas, or distributing channels, and the outlay on the main works has been curtailed accordingly.

Table of the dates of receipt and dispatch of the Budgets of 1860-61.

Name of Administration.	Received.	Orders passed.	Supplementary orders issued.	Amount allowed.
	Returned on 1859-60.			Lakhs.
Madras ...	9th March 1860 ...	2nd May 1860 ...	30th July 1860 ...	66
Bombay ...	30th June ...	27th July ...	...	16
Bengal ...	14th May ...	29th ...	...	19
N. W. Provinces ...	31st March ...	19th May ...	...	20
Oudh ...	31st ...	19th ...	...	21
Punjab ...	7th April ...	17th April ...	24th July 1860 ...	17
Sindh ...	28th May ...	17th July ...	...	3½
Nagpoor ...	30th April ...	17th April ...	...	2
Pegu ...	28th June ...	28th ...	31st August 1860 ...	6
T. and M. Provinces ...	27th March ...	2nd May ...	...	2½
Straits Settlements ...	11th April ...	19th July ...	...	3
Hyderabad ...	21st Dec. 1859 ...	23rd ...	...	8
Coorg ...	30th July 1860 ...	8th May ...	...	1
Mysore ...	...	17th ...	...	½

S. T. Dobbs, P. W. Dept. Press.—865.

APPENDIX A.

RETURN OF SANCTIONED PUBLIC WORKS EXPENDITURE FOR 1860-61.

Compared with the Extent, Population, and Revenue of the several Local Governments of India.

GOVERNMENTS.	Particulars.	Area in Square Miles.	Population.	Total Revenue. £	Land Revenue. £	SANCTIONED EXPENDITURE, &c. (N. B.—No sums in many cases have been lent to the Local Governments to assist the Adjoining Within the Table Amount allowed.) ORIGINAL WORKS: Military Buildings.	Civil Buildings.	Agricultural Works.	Communications.	Miscellaneous Public Works.	Total.	REPAIRS: Military Buildings.	Civil Buildings.	Agricultural Works.	Communications.	Miscellaneous Public Works.	Total.	Establishment Charges.	Reserved for unforeseen requirements and petty works.	Grand Total.
Madras	Total	136,872	22,031,697	6,181,190	4,109,254	55,230	54,572	32,518	43,875	2,505	182,554	18,406	14,337	136,649	99,918	1,625	259,946	109,900	37,500	620,000
	Per square mile	1	170	46	30·16	404	398	240	320	18	1,381	134	105	998	730	12	1,900	1,179	273	4,530
	Per million souls	6,262	1,000,000	280,647	186,576	2,508	2,477	1,475	1,992	114	8,289	836	651	6,202	4,535	74	11,778	4,992	1,702	28,187
	Per £100 of Total Revenue ...	2·21	356	100	66	0·89	0·88	0·53	0·71	0·04	2·95	0·30	0·23	2·21	1·61	0·03	4·18	1·77	0·61	10·03
	Per £100 of Land Revenue ...	3·29	536	149	100	1·34	1·32	0·79	1·06	0·06	4·44	0·45	0·34	3·32	2·42	0·04	6·29	2·66	0·91	15·07
	Proportion of the whole ...	...	...	...	...	0·90	0·88	0·53	0·71	0·04	2·95	0·30	0·23	2·21	1·61	0·03	4·18	1·77	0·61	10·00
Bombay	Total	140,467	12,098,113	8,153,871	2,020,239	77,849	18,784	25,354	42,894	29,802	1,00,283	23,138	7,900	102,000	30,000	547	163,585	110,932	19,250	505,000
	Per square mile	1	86	58·05	14·38	554	134	181	305	212	1,387	165	56	726	213	4	1,164	790	137	3,597
	Per million souls	11,626	1,000,000	670,525	166,959	6,435	1,546	2,140	3,546	2,463	14,344	1,920	653	8,431	2,479	46	13,528	9,171	1,590	41,732
	Per £100 of Total Revenue ...	2·76	166	100	47	0·95	0·23	0·31	0·52	0·36	1·23	0·28	0·09	1·25	0·37	0·00	2·00	1·36	0·24	6·20
	Per £100 of Land Revenue ...	4·03	417	253	100	1·92	0·42	0·63	1·06	0·80	4·83	0·57	0·19	2·52	0·74	0·01	4·03	2·73	0·47	17·46
	Proportion of the whole ...	...	...	...	...	0·38	0·09	0·13	0·21	0·15	0·96	0·11	0·04	0·50	0·15	0·00	0·80	0·55	0·09	2·00
Bengal	Total	253,000	40,852,927	10,400,705	8,717,992	43,126	79,770	2,469	89,557	125	194,987	22,985	38,000	26,300	58,413	14,479	156,370	94,309	69,250	514,917
	Per square mile	1	161	41·1	34·7	171	315	9·8	353	...	77	9·08	150	104	231	57	618	373	274	2,035
	Per million souls	6,211	1,000,000	252,279	213,358	1,055	1,953	61	2,192	...	4,772	571	930	644	1,430	350	3,844	2,308	1,695	12,610
	Per £100 of Total Revenue ...	2·44	391	100	84	0·41	0·77	0·02	0·86	...	1·875	0·22	0·36	0·25	0·56	0·14	1·502	0·90	0·66	4·931
	Per £100 of Land Revenue ...	2·77	1,686	277	100	1·23	2·15	0·07	2·47	...	5·372	0·63	1·07	0·72	1·61	0·40	4·127	2·602	1·910	13·736
	Proportion of the whole ...	...	...	...	...	0·08	0·15	0·00	0·17	...	0·37	0·04	0·07	0·05	0·11	0·02	0·31	0·18	0·13	1·00
N. W. Provinces ... * Includes Kumaon, Gurwhal, Terai, Dehra Doon, Simla, Bareilly Road 15,000 square miles, Central Circle Station 10,000	Total	105,000	30,250,000	6,629,189	4,272,695	109,278	43,909**	83,195	42,375*	31,304*	309,912	24,193	13,055	43,921	51,2	108	130,905	109,745	82,848	616,000
	Per square mile	1	270	63·14	39·68	1·042	418	792	403	298	2,953	230	124	418	488	1	1,246	1,045	789	5,868
	Per million souls	8,271	1,000,000	219,214	141,256	3,613	1,452	2,750	1,400	1,035	10,250	799	514	1,317	1,6	3	4,528	3,626	2,564	20,371
	Per £100 of Total Revenue ...	1·65	456	100	64	1·65	0·66	1·25	0·63	0·47	4·673	0·36	0·19	0·66	0·7	0·00	2·067	1·65	1·24	9·311
	Per £100 of Land Revenue ...	2·56	713	155	100	2·55	1·03	1·95	0·97	0·73	7·241	0·56	0·30	1·03	1·2	0·00	3·229	2·573	1·93	14·370
	Proportion of the whole ...	...	...	...	...	0·18	0·07	0·14	0·06	0·05	0·50	0·04	0·02	0·07	0·0	0·00	0·21	0·18	0·13	1·00
Punjab	Total	99,600	15,467,821	3,180,000	1,982,400	49,475	32,495	74,520	90,691	... ...	247,087	17,597	1,609	25,421	...	...	102,777	111,092	40,964	510,000
	Per square mile	1	155	32	21	0·18	309	779	910	... ...	2,481	184	16	255	...	...	1,073	1,162	413	5,125
	Per million souls	6,180	1,000,000	205,598	128,185	3,197	2,099	4,816	5,863	... ...	15,976	1,138	104	1,644	...	23	6,885	7,179	2,649	32,982
	Per £100 of Total Revenue ...	0	486	100	62	1·55	1·022	2·342	2·849	... ...	7·767	0·55	0·05	0·79	...	0·00	3·231	3·493	1·288	16·036
	Per £100 of Land Revenue ...	0·62	780	161	100	2·496	1·64	3·757	4·566	... ...	12·459	0·89	0·07	1·28	...	0·00	5·194	5·602	2·064	25·782
	Proportion of the whole ...	...	...	...	...	0·09	0·07	0·15	0·18	... ...	0·49	0·04	...	0·05	...	0·00	0·20	0·22	0·08	1·00
Oudh	Total	23,000	7,000,000	1,197,331	1,042,026	194,558	10,453	... ...	8,675	... ...	209,949	194	2,350	...	...	...	12,763	22,240	5,000	250,000
	Per square mile	1	304	52·05	45·30	8·459	454	... ...	377	... ...	9,126	8·43	102	...	...	...	554	966	217	10,869
	Per million souls	3,571	1,000,000	171,047	148,861	27,794	1,493	... ...	1,239	... ...	29,986	27·71	335	...	...	...	1,818	3,177	714	35,714
	Per £100 of Total Revenue ...	0·016	584	100	87·02	16·25	0·87	... ...	0·72	... ...	17·54	0·016	0·196	...	...	...	1·066	1·858	0·417	20·884
	Per £100 of Land Revenue ...	0·019	672	114·931	100	18·67	1·0	... ...	0·83	... ...	20·15	0·018	0·225	...	...	...	1·225	2·134	0·48	23·980
	Proportion of the whole ...	...	...	...	...	0·77	0·04	... ...	0·03	... ...	0·84	0·00	0·009	...	...	...	0·05	0·089	0·02	1·00
Nagpoor	Total	79,432	4,850,000	405,634	292,784	12,791	4,165	... ...	1,229	... ...	17,987	950	124	65	1,855	600	3,595	14,966	19,062	60,000
	Per square mile	1	61	5·104	3·68	0·16	0·052	... ...	0·015	... ...	0·226	0·011	0·001	...	0·023	0·007	0·045	0·188	0·239	0·755
	Per million souls	16,881	1,000,000	83,640	62,350	2,636	858	... ...	1,314	... ...	4,788	196	25	...	382	123	741	3,085	4,000	12,368
	Per £100 of Total Revenue ...	19·73	1,196	100	72	3·15	1·026	... ...	0·871	... ...	4·436	0·234	0·030	...	0·457	0·147	0·886	3·693	4·696	14·7
	Per £100 of Land Revenue ...	26	1,565	130	100	4·163	1·345	... ...	1·139	... ...	5·806	0·306	0·039	...	0·597	0·192	1·159	4·833	6·107	19·458
	Proportion of the whole ...	...	...	...	...	0·21	0·06	... ...	0·02	... ...	0·37	0·02	0·002	...	0·03	0·01	0·06	0·25	0·32	1·00
Pegu ... ... * Includes Ajyabab Lighthouse 425,000	Total	32,750	800,974	452,199	120,849	25,193	19,109	... ...	... ...	... ...	71,288*	64,976	17,585	1,003	43	5,150	5,150	30,000	16,034	15,700	120,710
	Per square mile	1	25	13·05	3·747	0·73	0·58	... ...	... ...	... ...	2·173	1·983	0·536	0·030	0·001	0·157	0·157	0·915	0·489	0·479	3·683
	Per million souls	39,514	1,000,000	565,248	150,951	31,479	16,780	... ...	... ...	... ...	89,259	81,304	21,994	1,254	53·8	6,442	6,442	37,530	17,052	20,051	150,951
	Per £100 of Total Revenue ...	7·11	178	100	26	5·574	4·228	... ...	... ...	... ...	15·802	14·407	3·897	0·222	0·009	1·141	1·141	6·651	3·537	3·466	26·656
	Per £100 of Land Revenue ...	27·03	683	382	100	21·412	16·242	... ...	... ...	... ...	60·654	55·317	14·966	0·853	0·034	4·382	4·382	25·553	13·591	77·035	102·035
	Proportion of the whole ...	...	...	...	...	0·21	0·16	... ...	... ...	... ...	0·71	0·64	0·17	0·01	0·00	0·05	0·05	0·30	0·16	0·18	1·00
Tenasserim and Martaban Provinces.	Total	38,000	814,276	149,984	43,166	1,320	1,324	... ...	1,708	240	9,152	1,631	1,157	...	...	1,064	144	4,000	4,848	5,039	22,500
	Per square mile	1	21	3·923	1·135	0·34	0·34	... ...	0·44	0·06	2·40	0·42	0·30	...	...	0·27	0·03	1·05	1·27	1·32	5·91
	Per million souls	46,660	1,000,000	184,225	53,000	1,621	1,626	... ...	2,097	295	11,239	2,002	1,420	...	...	1,306	177	4,911	5,954	6,187	27,637
	Per £100 of Total Revenue ...	25·33	543	100	29	0·879	0·882	... ...	1·139	0·160	6·102	1·087	0·771	...	...	0·709	0·096	2·667	3·232	3·359	15·010
	Per £100 of Land Revenue ...	87·8	1,884	346	100	3·046	3·056	... ...	3·955	0·555	21·152	3·767	2·671	...	...	2·456	0·333	9·243	11·197	11·636	52·489
	Proportion of the whole ...	...	...	...	...	0·06	0·06	... ...	0·07	0·01	0·20	0·03	0·02	...	...	0·02	0·00	0·09	0·11	0·11	0·50
Straits	Total	1,373	265,549	132,962	... ...	37,749	10,378	256	705	3,230	54,318	1,230	2,221	...	121	1,520	176	4,047	6,611	2,078	67,005
	Per square mile	1	193	96·84	... ...	27·49	7·559	0·186	0·513	2·352	39·569	0·895	1·617	...	0·088	1·107	0·128	2·947	4·814	1·513	48·824
	Per million souls	7,615	1,000,000	484,798	... ...	142,136	39,062	1,414	2,719	16,295	204,626	4,631	11,645	...	457	5,723	663	15,219	24,891	7,824	252,339
	Per £100 of Total Revenue ...	199	412	100	... ...	28·389	7·803	0·192	0·529	2·429	40·542	0·917	1·662	...	0·091	1·133	0·131	3·016	4·931	1·549	50·038
	Per £100 of Land Revenue ...	...	...	...	...	70·88	19·43	0·478	1·317	6·048	100·951	2·284	4·137	...	0·227	2·822	0·327	7·514	12·278	3·858	124·601
	Proportion of the whole ...	...	...	...	...	0·56	0·15	0·003	0·010	0·048	0·81	0·018	0·033	...	0·002	0·022	0·002	0·060	0·098	0·031	1·00
Hyderabad ... ... (Nizam's Dominions)	Total	...	...	...	...	30,000	1,350	... ...	6,150	... ...	37,500	1,250	500	...	...	750	70	2,750	6,042	7,500	53,900
	Per square mile	...	...	...	...	...	...	... ...	...	... ...	...	...	...	...	...	...	...	...	...	...	...
	Per million souls	Military	Buildings in the Cantonments of	Secunderabad &	Trunk Army	and Serbs in	the Nizam's	Dominions.	...	... ...	...	...	...	...	...	...	...	...	...	...	...
	Per £100 of Total Revenue ...	...	...	...	...	55·65	2·504	... ...	11·407	... ...	69·564	2·318	0·927	...	...	1·391	0·129	5·104	11·207	13·911	100·000
	Per £100 of Land Revenue ...	...	...	...	...	80	3·6	... ...	16·4	... ...	100	3·3	1·3	...	...	2·0	0·2	7·3	16·1	20·0	144·0
	Proportion of the whole ...	...	...	...	...	0·55	0·02	... ...	0·11	... ...	0·69	0·02	0·009	...	...	0·01	0·001	0·05	0·11	0·14	1·00
Coorg	Total	2,116	153,600	23,152	19,385	... ...	50	... ...	1,800	... ...	1,850	70	95	...	...	300	5	470	... ...	... ...	7,500
	Per square mile	1	64	10·93	9·9	... ...	0·23	... ...	0·85	... ...	0·87	0·033	0·044	...	...	0·141	0·002	0·221	... ...	... ...	3·543
	Per million souls	13,802	1,000,000	150,781	96,837	... ...	325	... ...	11,718	... ...	12,043	455	618	...	...	1,953	32	3,058	... ...	... ...	48,828
	Per £100 of Total Revenue ...	6·41	663	100	82	... ...	0·215	... ...	7·774	... ...	7·989	0·302	0·410	...	...	1·295	0·021	2·029	... ...	... ...	32·378
	Per £100 of Land Revenue ...	7·817	1,018	153	100	... ...	0·331	... ...	11·939	... ...	12·270	0·464	0·630	...	...	1·989	0·032	3·115	... ...	... ...	49·728
	Proportion of the whole ...	...	...	...	...	... ...	0·001	... ...	0·024	... ...	0·025	0·001	0·001	...	...	0·004	0·000	0·006	... ...	... ...	0·102
Total British	Total	980,232	120,466,419	34,916,468	17,446,830	2,242,150	247,830	327,796	317,199	36,242	3,211,227	126,605	86,145	337,259	200,854	23,827	774,890	533,351	200,781	4,848,505**
	Per square mile	1	123	35·61	20·2	2·287	0·252	0·334	0·323	0·036	3·277	0·129	0·087	0·343	0·204	0·024	0·790	0·543	0·204	4·945
	Per million souls	8,132	1,000,000	289,780	144,814	18,611	2,057	2,721	2,632	300	26,671	1,050	715	2,799	1,667	197	6,429	4,426	1,666	40,237
	Per £100 of Total Revenue ...	2·8	345	100	50	6·421	0·709	0·938	0·908	0·103	9·199	0·362	0·246	0·965	0·572	0·067	2·216	1·471	0·572	13·874
	Per £100 of Land Revenue ...	5·6	690	200	100	12·846	1·419	1·877	1·817	0·207	18·408	0·724	0·493	1·931	1·145	0·134	4·433	2·943	1·144	27·752
	Proportion of the whole ...	...	...	...	...	0·46	0·05	0·07	0·06	0·01	0·66	0·02	0·01	0·06	0·04	0·00	0·16	0·11	0·04	1·00
Hyderabad Assigned Districts.	Total	25,624	2,917,637	406,100	412,000	625	9,555	730	2,725	... ...	13,634	510	350	1,350	450	70	3,140	8,950	1,055	27,450
	Per square mile	1	78	15·8	16·05	0·024	0·372	0·028	0·106	... ...	0·531	0·019	0·013	0·052	0·017	0·002	0·122	0·348	0·041	1·071
	Per million souls	13,950	1,000,000	139,278	141,220	214	3,275	250	934	... ...	4,673	174	119	462	154	23	1,076	3,067	361	9,404
	Per £100 of Total Revenue ...	0·98	718	100	101	0·153	2·353	0·179	0·671	... ...	3·356	0·125	0·086	0·332	0·110	0·017	0·772	2·203	0·259	6·631
	Per £100 of Land Revenue ...	0·9	707	98	100	0·151	2·319	0·177	0·661	... ...	3·307	0·123	0·085	0·327	0·109	0·017	0·761	2·171	0·255	6·534
	Proportion of the whole ...	...	...	...	...	0·02	0·34	0·02	0·09	... ...	0·49	0·01	0·01	0·04	0·01	0·00	0·11	0·32	0·03	1·00
Mysore	Total	30,386	5,822,325	870,340	697,419	... ...	4,621	11,106	4,163	1,050	21,000	... ...	1,449	14,651	10,867	94	27,141	13,918	3,000	60,000
	Per square mile	1	191	28·7	19·05	... ...	0·152	0·365	0·137	0·034	0·691	... ...	0·047	0·482	0·357	0·003	0·893	0·457	0·098	1·974
	Per million souls	4,264	1,000,000	149,500	119,780	... ...	793	1,907	715	180	3,607	... ...	249	2,516	1,866	16	4,661	2,391	515	10,313
	Per £100 of Total Revenue ...	3·45	691	100	80	... ...	0·531	1·276	0·478	0·120	2·413	... ...	0·166	1·683	1·248	0·010	3·119	1·599	0·344	6·888
	Per £100 of Land Revenue ...	4·11	859	247	100	... ...	0·662	1·592	0·596	0·150	3·010	... ...	0·207	2·099	1·556	0·012	3·889	1·994	0·429	8·593
	Proportion of the whole ...	...	...	...	...	... ...	0·08	0·18	0·07	0·02	0·35	... ...	0·02	0·24	0·18	0·00	0·44	0·23	0·05	1·00
GRAND TOTAL*	Total	962,702	140,944,288	36,253,843	19,856,249	2,417,844	257,508	338,961	319,627	91,305	3,425,245	130,575	87,972	352,660	211,321	24,001	816,487	552,220	207,466	5,451,414
	Per square mile	1	146	37·6	20·6	2·511	0·267	0·352	0·331	0·094	3·557	0·135	0·091	0·366	0·219	0·024	0·847	0·573	0·215	5·662
	Per million souls	6,830	1,000,000	257,234	140,913	17,154	1,827	2,405	2,267	648	24,301	926	624	2,502	1,499	170	5,793	3,918	1,472	38,679
	Per £100 of Total Revenue ...	2·65	388	100	54	6·671	0·71	0·935	0·881	0·252	9·451	0·360	0·242	0·972	0·583	0·066	2·253	1·523	0·572	15·037
	Per £100 of Land Revenue ...	4·85	713	183	100	12·175	1·297	1·707	1·609	0·459	17·251	0·657	0·442	1·775	1·064	0·120	4·113	2·780	1·044	27·445
	Proportion of the whole ...	...	...	...	...	0·44	0·05	0·06	0·06	0·02	0·63	0·02	0·02	0·06	0·04	0·00	0·15	0·10	0·04	1·00

The Area, the Population, the Land Revenue, and the Total Revenue of the Punjab, Oudh, and the Reformed Assigned Districts are taken from Returns of 1860-61, furnished by the Authorities of those Provinces respectively. The Returns for 1860-61 from the other Governments and Administrations had not been received at the time of the preparation of this Table, the data of previous years have therefore been adopted. For the other Provinces the Land Revenue and Total Revenue are taken from a Return furnished by the Secretary to the Government of India from Financial Departments, for the year 1859-60. The gross Revenue of Bengal is, in the Financial Department Return, given at Rs. 31,43,48,000, from which are deducted the Sums of Opium receipts, Rs. 1,37,98,000, and the receipts of Opium and Salt advances for Bengal, Rs. 75,49,000. The Gross Net Total Revenue is, as in the N. W. Provinces, adopted as the Revenue of Bengal, and consists of advances, Rs. 1,34,49,000, which brings the N. W. Provinces' Revenue up to Rs. 3,04,97,000, or some given. In the case of Bombay, the Nizam's Dominions, the Straits Settlements, and the Provinces of Tenasserim and Martaban, the Revenue is taken from the Administration Reports of 1860-61, as the Financial Department Returns have not given the Gross Revenue separate from those of the other Provinces. The Parliamentary Returns dated 28th July 1862, furnished the area and population of Nagpoor and of the Native Settlements; as also the population of Bengal and the area of Fagpoor's Dominions. The area and population of Mysore and of the Straits Settlements; as also the population of Bengal and the area of Fagpoor's Dominions. The area and population of Bombay and of the Straits Settlements; as also the population of Bengal and the area of Fagpoor's Dominions. The area and population of Mysore

Statement showing the progress made in bringing up arrears of Accounts in Bengal, N. W. Provinces, Punjab, and Nagpore as shown in the Reports for February 1861.

COMPLETE ACCOUNTS RECEIVED.

Bengal.				N. W. Provinces.				Punjab.				Nagpore.			
Division.	Date up to which received.	Months in arrear.		Division.	Date up to which received.	Months in arrear.		Division.	Date up to which received.	Months in arrear.		Division.	Date up to which received.	Months in arrear.	
1st Calcutta	Chief Accountant	Dec. 1860	1	Agra Division	Dec. 1860	1		Peshawur	Dec. 1860	1		Nagpore	Dec. 1860	1	
	Assistant Engineer, 2nd Bridge Trust	Dec. 1860	1	Meerut	Dec. 1860	1		Rawul Pindee	Dec. 1860	1		Ramgurh	Dec. 1860	1	
	Suburban Roads	Dec. 1860	1	Rohilcund	Dec. 1860	1		Jullundur	Dec. 1860	1		Chanda	Dec. 1860	1	
	Presidency Jail	Dec. 1860	1	Kumaon	Dec. 1860	1		Umballa	Dec. 1860	1		Chindwara	Dec. 1860	1	
2nd Calcutta	Chief Accountant	Dec. 1860	1	Agra and Bombay Road	Dec. 1860	1		Lahore	Dec. 1860	1					
	Agra and Bombay Road	Dec. 1860	1	Allahabad and Jhansi Road	Dec. 1860	1		Multan	Dec. 1860	1					
1st Dacca	Dacca Division	Dec. 1860	1	Benares Division	Dec. 1860	1		Peshawur	Dec. 1860	1					
	Dacca	Dec. 1860	1	Benares	Dec. 1860	1		Rawul Pindee	Dec. 1860	1					
	Mymensingh	Dec. 1860	1	Jounpore	Dec. 1860	1		Jullundur	Dec. 1860	1					
	Sylhet	Dec. 1860	1	Ghazeepore	Dec. 1860	1		Umballa	Dec. 1860	1					
	Cachar	Dec. 1860	1	Allahabad	Dec. 1860	1		Lahore	Dec. 1860	1					
	Jynteah	Dec. 1860	1	Cawnpore	Dec. 1860	1		Multan	Dec. 1860	1					
	Arracan	Dec. 1860	1	Agra	Dec. 1860	1									
2nd Dacca	Chittagong Division	Dec. 1860	1	Allahabad	Dec. 1860	1									
	Chittagong	Dec. 1860	1	Cawnpore	Dec. 1860	1									
	Tipperah	Dec. 1860	1	Agra and Allahabad Road	Dec. 1860	1									
	Noakhally	Dec. 1860	1	Agra and Cawnpore Road	Dec. 1860	1									
	Backergunge	Dec. 1860	1	Agra and Allahabad Road	Dec. 1860	1									
	Pubna	Dec. 1860	1	Agra and Cawnpore Road	Dec. 1860	1									
	Bhauleah	Dec. 1860	1	Agra and Allahabad Road	Dec. 1860	1									
	Rajeshaye	Dec. 1860	1	Agra and Cawnpore Road	Dec. 1860	1									
	Jessore	Dec. 1860	1	Agra and Allahabad Road	Dec. 1860	1									
	Furreedpore	Dec. 1860	1	Agra and Cawnpore Road	Dec. 1860	1									
	Midnapore	Dec. 1860	1	Agra and Allahabad Road	Dec. 1860	1									
	Hooghly	Dec. 1860	1	Agra and Cawnpore Road	Dec. 1860	1									
	Burdwan	Dec. 1860	1	Agra and Allahabad Road	Dec. 1860	1									
	Nuddea	Dec. 1860	1	Agra and Cawnpore Road	Dec. 1860	1									
	Moorshedabad

APPENDIX C.

Return of Projects for Public Works in India, estimated likely each to cost more than one lakh of Rupees, postponed or retarded for want of funds.

Local Govt.	General description of Project.	Estimate.	Expended. N. B.—Expenditure, when entered, is almost without exception up to 1st January 1860.	Recommended to be spent			Remarks.
				In 1860-61.	In 1861-62.	Thereafter annually, until amount of Estimate shall have been reached.	
		Rs.	Rs.	Rs.	Rs.	Rs.	
Madras.	13 Projects. Irrigation and Navigation ... ... 3 do. Communications,—Roads, Bridges or Tunnels	41,48,828	10,91,326	10,50,068	10,42,059	8,17,035	15 out of 17 of these projects appear to be complete. The remaining 2 do not appear at all in the figured Statements.
	Also the Chief Engineer notes as of super-eminent importance the proposed operations in connection with the Upper Godavery Navigation	29,25,000	None	5,75,000	5,75,000	5,75,000	
Bombay Presidency. Bombay (Proper.)	11 Projects. Communications, Roads, Bridges or Tunnels ... ... 2 do. General,—Public Works ... ... 1 do. Naval ... ... 1 do. Judicial,—Jails... ... ... 1 do. Military,—Accommodation for troops. None marked as of pre-eminent importance above the rest.	48,83,473	5,88,616	12,75,578	12,31,277	5,80,000	All these projects complete.
Sindh.	4 Projects. Irrigation and Navigation ... ... 3 do. Communications,—Roads, Bridges and Tunnels ... ... 1 do. General,—Charitable Institution .. None marked as of pre-eminent importance.	54,07,540	Not stated	31,25,000	20,00,000	2,82,540	7 of these 8 projects complete.
Bengal Presy. Lower Provinces.	1 Project. Irrigation and Navigation ... ... 5 do. Communications,—Roads, Bridges or Tunnels ... ... 2 do. Educational ... ... 1 do. Post Office and Electric Telegraph ... None marked as of pre-eminent importance.	1,17,16,896	Not stated	8,83,000	14,40,000	14,40,000	5 of these projects seem complete.
	Carried over. ...	2,90,31,737	16,79,942	69,08,646	62,88,336	36,94,575	

[P. W. Dept.]

Return of Projects,—Continued.

Local Govt.	General description of Project.	Estimate.	Expended. N. B.—Expenditure, when entered, is almost without exception up to 1st January 1860.	Recommended to be spent			Remarks.
				In 1860-61.	In 1861-62.	Thereafter annually, until amount of Estimate shall have been reached.	
		Rs.	Rs.	Rs.	Rs.	Rs.	
	Brought forward ...	2,90,81,737	16,79,942	69,08,646	62,88,336	36,94,575	
Lower Provs.	1 Project. Control of Mahanuddee. Not included in Chief Engineer's Statement ...	11,00,000	None	say 5,00,000	say 5,00,000	say 1,00,000	Project complete.
Bengal Presidency. N. W. P., Chief Engr., Agra.	1 Project. Military,—Fortifications ... 4 do. Do. Accommodation for troops ... 1 do. Do. Commissariat ... 1 do. Do Staff ... ... 1 do. General,—Government ... ... 2 do. Communications,—Roads, Bridges or Tunnels ... ... None marked as of pre-eminent importance.	31,72,892 Add (see column of remarks) 10,00,000	Not stated	24,34,359	17,38,533	None	It seems doubtful whether more than 1 of these projects are complete. No amounts are entered in Chief Engineer's Statement opposite 3 important items, viz:— Buildings for Rum and Malt Liquor, Allahabad. Ditto Gun Carriage and Clothing Agency, ditto. Ditto Civil Offices. They have been here put down at 10,00,000 in the aggregate. The *Govt.*, N. W. P., proposes an expenditure of Rs. 11,54,359 for 1860-61.
N. W. P. Sanger & Nerbudda.	1 Project. Communications,—Roads, Bridges or Tunnels	2,15,572	Not stated	47,000	Not stated. Say 50,000	say 1,00,000	Project appears complete. Govt., N. W. P., proposes Rs. 32,000 as expenditure for 1860-61.
N. W. P. Supt. Irrigation.	4 Projects. Irrigation and Navigation	Original Estimate 1,51,24,063 Add for losses by mutiny 18,05,237	1,48,18,000	7,31,300	Not stated. Say 7,00,000	say 6,80,000	Projects complete. Govt., N. W. P., proposes expenditure of Rs. 3,00,000 in 1860-61. N. B.—In none of the above 3 instances is any reason assigned for including expenditure as proposed by Chief Engineers.

Bengal Presidency. Punjab. Supt. Irrign.	2 Projects.	Irrigation and Navigation	5,09,618	36,467	1,99,808	1,10,000	1,10,000	Projects complete.
	1 do.	Industrial,—Manufactures						
Ch. Engr.	10 Projects.	Communications,—Roads, Bridges or Tunnels	1,79,16,000	89,16,000	26,85,000	28,25,000	21,00,000	Of these 17 projects only 2 are complete.
	5 do.	Military,—Fortifications						
	2 do.	Drainage and Water supply						
Oudh.	3 Projects.	Communications,—Roads, Bridges or Tunnels	8,41,500	None	4,05,000	4,14,500	2,00,000	None of these projects complete. One of them, being for a road from Fyzabad to Papamow Ghat, opposite Allahabad, has been altered in D. P. W. Office by addition of 20 miles of road within territory of N. W. P. Govt., at Rs. 4,000 per mile.
Pegu.	Number of projects not stated. Assumed therefore to be one for each item.	Judicial,—Court Houses	40,50,000	Not stated	2,25,000	6,50,000	10,00,000	Probably about half these projects complete.
		Do. Jails						
		Revenue,—Customs						
		Municipal, Sewerage, &c.						
		Marine,—Harbours and Navigation ...						
		Communications,—Roads, Bridges or Tunnels						
	Add also as noted by Commissioner of special importance—							
		Military,—Fortifications	4,50,000	Not stated	1,00,000	2,50,000	50,000	About half these projects complete.
		Do. Ordnance						
		Do. Commissariat						
Nagpoor.	1 Project.	Judicial,—Jails	29,24,530	Not stated	1,20,230	9,00,000	9,00,000	None of these projects complete.
	6 Do.	Communications,—Roads, Bridges or Tunnels						
Tenasserim & Martaban.	None.							
Straits Settlements.	1 Project.	General,—Government	1,20,000	None	1,20,000	None	None	Projects complete.
		Total Rs. ...	7,83,11,149	2,54,50,409	1,44,76,343	1,44,26,369	89,34,575	

N. B.—Many of the Projects above reported incomplete are so in the sense that an estimate for an important road, matured in all other respects, would still be incomplete where the passage of any great river had not been provided for. It is believed that few of the Projects comprised in this Return are not sufficiently digested to permit of progress being made to the best advantage.

Abstract.

	No. of Projects.
Irrigation and Navigation	25
Communications,—Roads, Bridges or Tunnels	45
General,—Public Works	3
Do. Charitable Institutions	1
Do. Government	2
Naval	1
Judicial,—Jails	3
Do. Court Houses, &c.	1
Educational	2
Post Office and Electric Telegraph	1
Marine,—Harbours and Navigation	1
Military,—Accommodation for troops	5
Do. Fortifications	7
Do. Commissariat	2
Do. Ordnance	1
Do. Staff	1
Industrial,—Manufactures	1
Drainage and Water supply	2
Revenue,—Customs	1
Municipal,—Sewerage	1

Total about 106 Projects, of which 61 may be called complete, and the remaining 45 more or less incomplete.

NOTE.—Some of the papers on which this Return has been founded having been submitted on different dates, refer to states of expenditure and prospects of progress slightly differing from each other. Their results will not therefore invariably check with those given above.

4. In the Sketch Map attached to Colonel Maxwell's letter, and accompanying the correspondence, the main lines of communication through the Province are shown. The most important, as affording the means of transport to the ports of shipment, are, as regards cotton, the Great Deccan and the Southern lines. On a rough calculation, the mileage of the feeders to these lines requiring to be opened out and improved in the Nagpoor and Chanda Districts, may be estimated to extend over 300 miles, and with a little exertion, and the requisite aid in money, much may be effected during the ensuing working season. [*P. W. Dept.*]

5. After the lapse of the Province in 1853-54, a one per cent. Road Fund was established in each district, from which very little has hitherto been expended, so that the accumulations on the past years now amount to something considerable.*

* *Note.*—A detailed Report on the Road Fund has been submitted in the Foreign Department, and rules prescribed for its future management.

A portion of these accumulationss may, I think, very properly be expended in opening out these district lines; but without the aid of Government, no material improvement can be effected. A reference to the letter from the Chief Engineer, accompanying this Report, will show that in his opinion a sum of not less than Rs. 200 per mile would be needed to make these lines passable, or to put them on the footing of fair-weather roads. I would go further than this, and suggest an expenditure of Rs. 250 a mile, a sum which has, I am told, been allowed on other occasions for making fair-weather roads. For 300 miles an outlay to this extent would require funds amounting to Rs. 75,000, out of which sum the District Road Funds might fairly contribute one-third, or Rs. 25,000. With the number of projects now on its hands, the Department of Public Works could not possibly undertake this additional task unaided, and I would propose to obtain the co-operation of the Committees for local improvement, already formed in each district. To add to the efficiency of these Committees, and to forward the efforts of the District Officers, some direct executive assistance might with advantage be provided, the present agency of the Department of Public Works not being strong enough to afford more than its professional advice and instructions; I would urge, therefore, that, as recommended by Colonel Maxwell, a qualified Native Surveyor should be appointed to each district, to be placed under the orders of the Local Committees, their salaries being defrayed from the Road or other Local Funds.

6. The foregoing project has reference solely to the Nagpoor and Chanda Districts. In Raepoor, the opening up of the communications with the neighbouring territories would also, I feel assured, be attended with the greatest benefit to the Public at large, as well as to the district itself, notwithstanding the statement of the Officiating Deputy Commissioner,† that "no complaints are made of the want of well made roads being any obstacle to the traffic."

† Letter No. 186, dated 16th April 1861, para. 7, copy accompanying.

From its distance from all the lines of ordinary travel, this district is almost unknown, except in name, beyond its own borders. With the exception of the one line‡ running east and west towards Cuttack and Nagpoor, there may be said to be no

‡ *Note.*—This is to be a 2nd Class road, extending from Bishnoor on the Wurda, towards Oomraotee, and running through Nagpoor, Bhundarra, and Raepoor, to the Junk Nuddee, in the direction of Sumbhulpoor and Cuttack.
The residents of Raepoor get their letters from Calcutta viâ Cuttack and Sumbhulpoor. It is the "old Raepoor Post road."

[*P. W. Dept.*] main road in the district, and the difficulties of transporting its varied produce to distant marts, leaves little more than nominal prices for the producer in the majority* of instances. The capabilities of this fine district are very great, not only from the growth of cotton, but also from grain of every description, oil seeds, lac, koosum, &c., &c., and I am convinced that with improved communications, the present Land Revenue (between five and six lakhs) might in a very few years be more than doubled.† The only portion of its produce which finds its way out of the Province is, that taken by Binjarries by a track almost unknown, save to themselves, to the Eastern Coast, as described by Captain Saxton in his letter of the 21st March last, No. 357, a copy of which accompanies this Report.

* Arrangements are in progress for completing the communication between Raepoor and Jubbulpoor over the Rajadhar or Chilpee Ghats.

† *Note.*—The introduction of the Survey into the Raepoor District is most desirable. The extent of culturable land, that of the first quality, is reported to be very great, but with a little more than a nominal value for produce from the want of outlets. An improvement in the lines of communications should be simultaneous with a proper assessment on the land after survey. The produce of Chutteesgurh in distant markets would realize sums which would amply repay the landholders for bringing the lands now waste under cultivation, whilst their extent with a liberal margin would greatly raise the present assessment. Nothing, however, can be attempted until the measurement of the lands can be effected.

This track appears to deserve more attention than it has hitherto received. From Captain Saxton's account, indeed, its being at all passable is owing to the efforts of the Rajah of Kalahundy or Kharondh (a Dependency of this Province), and I purpose to invite him to meet me at Chanda during the ensuing cold season, with the other Chiefs and Talookdars under the jurisdiction of the Deputy Commissioner on the Godavery, and to endeavour to keep up his interest on this road by pointing out the advantages that must accrue, not only to the District of Raepoor, but also to his own Estates, by its being established as a permanent line; at the same time, I would gladly have it in my power to assure him of funds being forthcoming to improve the line, and make it at once a good fair-weather road, travellable at all seasons. In effecting this object, the Rajah's co-operation and assistance may be turned to account. He would in his own Illaqua obtain labour much cheaper than we could.

I have requested Captain Saxton to furnish me with a Sketch Map of the country through which this road passes, as well as with any further information he may possess regarding it, with a view hereafter of proposing its permanent construction (on such a scale as may be found necessary) after examination and survey as a branch of the present eastern line from Nagpoor through Raepoor to Sumbhulpoor and Cuttack.

The road is clearly deserving of serious attention, not only as an outlet for the produce of the Raepoor District, but as an inlet for salt imported from the Coast in large quantities, and which will increase with the facilities for its transport. It appears to me also that this route would be better adapted for troops moving between this Province and the districts in the Madras Presidency on the Eastern Coast, than the more circuitous one now in use viâ Sumbhulpoor, the Ghat on which line is described as a very difficult one.

Note.—The Deputy Commissioner of Raepoor estimates the income from the tax recently imposed upon salt, at a lakh of Rupees.

7. In conclusion I would solicit the favourable consideration of His Excellency in Council to the project explained in the 5th para. of this letter, as a means of expediting, at no great cost, the transport to the ports of shipment of cotton grown in the Chanda and Nagpoor Districts, in localities off the main lines of road, and yet at no great distance from them. [*P. W. Dept.*]

8. I would refer also to the concluding passage of the Chief Engineer's letter under transmission. Colonel Maxwell's opinion on the subject is in accordance with my own. If the parties most interested in the Cotton Trade were to establish agencies in this part of the country, and introduce a proper system of pressing and packing, and create Establishments for providing the requisite carriage, the supply would very soon equal any demand that might be made. With improved communication and increased facilities for transport, this Province and the neighbouring districts north and south would very soon produce any amount of cotton which could possibly be required.

9. Annexed is a Table showing the prices realized this year at Bombay for cotton from Hingunghat, Oomraotee, and Arwee, including the cost of its transit from the places named.

From Depy. Commr., to Commr. of Nagpoor,—No. 296, *dated* 20*th September* 1860.

With reference to the Circular letter from your Office noted in the margin,* and the subsequent Memos. regarding it, transmitting a printed copy of a Despatch from the Hon'ble Court of Directors in the Revenue Department, dated 22nd July 1857, No. 10, calling for specimens of the cotton plant, and information regarding its culture, &c., &c., I have the honour to forward specimens of the plant, its produce, and the soil it is grown on, as enumerated marginally,† and to report as follows:—

* No. 23, dated 30th March 1858.

† 1. Packet of Soil.
2. " "
3. " "
4. " "
5. Specimen of Plant.
6. " of Flowers.
7. " of clean Cotton.
8. " of Cotton Seed.
9. " of uncleaned Cotton.

2. The soil upon which by far the greatest quantity of the cotton of this Province is grown, is that known all over India as the black cotton soil. It is extremely light and naturally rich, and requires very little manure, and, as a rule, gets none. The poorer kind of soil in which cotton is sometimes grown, is a mixture of this with a greyish earth and a quantity of lime-stone, and if this is situated near the village, it is sometimes manured.

3. The black soil or loam varies in depth from 1 foot to 20, and sometimes more; as a general rule, it is not much infested with weeds.

4. The cotton is sown in the commencement of the rains, immediately after the first fall, or from the middle of June to the middle of July, according to the season; it is occasionally planted in alternate rows with dall or toor, but mostly by itself; no artificial irrigation is employed, and with the exception of running a plough through between the rows of plants, to throw the earth up over the roots once when the plants have attained a few inches of growth, they are left to shift for themselves. The plant flowers in October or November, the picking commences in December, and goes on to the end of

[*P. W. Dept.*] February or middle of March; in good seasons the produce will yield a return of from 10 to 20 fold, while in inferior soils it seldom yields more than from 4 to 5; that is, supposing a maund weight of seed to be sown, the produce would be from 10 to 20 maunds in good, and from 4 to 5 maunds in indifferent land; but of this, on cleaning the cotton, three-fourths would be seed, so that for a maund of seed the produce in cleaned cotton would only be, off the best land, from 2½ to 5 maunds.

5. The black soil, in which the best cotton is grown, is the most fertile in India, and on it, in other localities, are produced the finest wheat, toor, jowarie, and other dry crops; it seldom, as before mentioned, is manured, and does not seem to require much deepening. It is usually turned up to the depth of 6 or 8 inches once or twice after the first showers in June, and then the seed is put down.

6. The seed used is that commonly produced in the country, and the character of the plant is herbaceous, and its average height may be put down at 36 inches, the spread of the branches being about 12 to 15; when the picking is over, cattle are turned in to graze on the leaves and more tender of the branches; and the stalks are in many places, where wood is not procurable near at hand, cut down and used by the poorer classes for fuel.

7. To the geological character of the district, I am unable to speak. The main feature of the cotton-growing portion of it is about 1,000 feet above the level of the sea, and is naturally well drained.

8. The rains usually commence early in June, and continues, with one or two breaks of 10 to 15 days each, till the beginning of October. Irrigation is no where employed.

From A. ROSS, ESQ., *Supt. of Survey and Settlement, to Depy. Commr. of Nagpoor,—No.* 91, *dated 3rd April* 1861.

With reference to the Notification lately issued by Government and seen by me in the newspapers, regarding the production and transport of Indian Cotton, I beg to hand you a Statement which I have had compiled from the Survey Khusrahs, showing the extent of cotton cultivation in the several Pergunnahs of the Nagpoor District.

2. I am afraid that observations from me, which your own superior local knowledge may render superfluous, will appear out of place; yet, as an accompaniment to the skeleton map forwarded herewith, showing the relative positions of the several Pergunnahs, I would remark that the great bulk of the cotton-producing lands is in Pergunnahs lying on the eastern and southern confines of the district, and the produce therefore does not require long transport through it, whether the line of exit be to Bombay viâ Berar, or to Madras viâ the Godavery. Ashtee, the western portion of Anjee, Nachengaon, Undoree, and Pohna, are all in the flat open country constituting the valley of the Wurdah; while Pownar and Hingunghat also occupy a comparatively champaign tract. Katal, Kondalee, and Kailjhur are the three largely producing Pergunnahs that most require improved means of intercommunication. Main roads run through all three, but the country is, as you are aware, hilly and difficult in the extreme. Anjee is also hilly to the east, but the ranges of hills from valleys traversable without much difficulty.

would have afforded a less enlightened or philanthropic Ruler a sufficient excuse for postponing it. But we must not forget that it originated in the mind of that great Statesman to whom the Province of Pegu is so deeply, so eternally indebted. Yes! he landed on this spot to see with his own eyes, as was his wont, and to form his own judgment. Here he at once determined a Lighthouse should stand, and here, this day, just after we have received the intelligence that, 'weary and worn' in the service of his Queen and Country, he has sunk into his rest, we have laid the first stone of this magnificent Tower, which, better than any sepulchral monument, shall carry down to posterity the honoured memory of Lord Dalhousie." [*P. W. Dept.*]

At the conclusion of this address, three cheers were given for Captain Fraser and for his assistants, after which the party adjourned to a collation in the workmen's temporary Barrack erected on the Reef.

During the Service, Captain Greenlaw succeeded in taking an excellent photograph of the scene.

[P. W. Dept.]

APPENDIX E.

From Secy. to Govt. of India, P. W. Dept. with G. G., to Secy. to Govt. of N. W. P.,—No. 300, dated 28th January 1861.

I am directed by the Governor General to request that His Honour the Lieutenant Governor will be good enough to supply His Excellency in this Department, as early as possible, with accurate information as to the action of the Ganges Canal during the present season, and the extent of its beneficial results in modifying the effects of scarcity.

From T. Moss, Esq., *Asst. Secy. to Govt. of N. W. P., in the P. W. D., to Secy. to Govt. of India, P W. Dept.,—No.* 191, *dated 25th March* 1861.

With reference to your letter No. 300, dated the 28th January last, I am directed by the Hon'ble the Lieutenant Governor to forward the accompanying copy of a letter No. 3679, dated 6th instant, from the Superintendent General of Irrigation, reporting on the action of the Ganges Canal during the present season, and the benefits resulting from irrigation in modifying the effects of scarcity.

2. His Honour, without taking it upon himself to endorse the detailed calculations which the Superintendent General has submitted, is of opinion that they are not unreasonable, being founded on experience gained on the Eastern Jumna Canal during 1859-60, when the demand for irrigation was very great.

3. The beneficial operation of the canal during the past season cannot be over-estimated. It failed, it is true, at the beginning of the agricultural season (July), when at Roorkee there was a depth of only two feet and nine inches, and when in the neighbourhood of Etah the channel was almost dry. But in the beginning of November, when His Honour passed over a part of the country (between Anoopshuhur and Allyghur) within its influence, it was working admirably, and the breadth of land within reach of its waters presented a wonderful contrast with the country generally.

4. The districts through which the Lieutenant Governor passed during his late tour, least benefitted by the canal, are those included in the Etawah Terminal Division. This is due, His Honour believes, to faults in the original construction of the Rajbuhas, and also in some measure to the various difficulties caused by the peculiar character of soil (shar zameen) in that quarter, and it is only within the last 10 or 12 days that the Collector of Mynpoorie has reported to His Honour the want of canal water and the enormous benefits which would arise from even a moderate supply. The defects of levels pointed out can only be remedied gradually, and His Honour knows that Captain Turnbull's attention is turned to the matter.

5. More recently demi-official reports have been received by His Honour from the Commissioner of the Meerut Division, who states that there is no part of his Division within reach where irrigation from the canal has not been largely availed of, and that the standing crops (produced *ab initio* with the aid of the canal) are as full and as fine as they could have been in the most prosperous of seasons. By the remark "produced *ab*

initio with the aid of the canal" is meant that the land was ploughed with the aid of water taken from the canal; that the seed was sown with the same aid, and would not have germinated without it, and that the produce is what the Commissioner has described it to be, only because it has been irrigated from the canal. Had there been no canal, there would have been no crop on broad lands, which are now covered with wheat and other cereals in large abundance. [P. W. Dept.]

6. His Honour repeats that the beneficial effect of the Ganges Canal in mitigating the scarcity of food and the severity of distress, cannot be over-estimated, and His Honour feels sure that it will be both good policy and good economy to push on this magnificent work to completion with the utmost vigour, even though at the risk of some present financial inconvenience.

From CAPT. A. D. TURNBULL, *Supt. Genl. of Irrigation, to Chief Engr. and Secy. to Govt. of N. W. P.,—No.* 3679—216, *dated 6th March* 1861.

In reply to your letter No. 559 A, dated 23rd ultimo, this day received, I have the honour to state, for the information of His Honour the Lieutenant Governor, North-Western Provinces, that the action of the Ganges Canal has been uninterrupted throughout the season, except for a few days when it was necessary to shut the water off for repairs to the Solani Aqueduct.

2. In regard to the extent of its beneficial results in modifying the effects of scarcity, I have the honour to report that I am hardly in a position to state what this is at present, though I trust to be able to do so soon after the close of the official year.

3. The best means I have of calculating the value of the crops sown along the line of the Ganges Canal this year, until the returns of irrigation are received, are as follows :—

4. The total of the water rate assessed during the past year on the Eastern Jumna Canal was Rs. 2,45,205, the total area of land actually watered was 355 square miles, and the quantity and value of the various crops grown were —

	Maunds.		Rs.
Sugarcane	8,02,425	...	22,54,814
Cotton	26,240	...	78,720
Rice	7,29,902	...	19,46,405
Indian Corn	1,28,812	...	1,61,015
Wheat and Oats	10,80,403	...	13,50,504
Barley, Gram, Jowar, and Oorud ...	1,81,157	...	2,07,037

giving a total of 21,20,274 maunds of cereal produce, valued at Rs. 36,64,961, or a total of produce, of every description, of 29,48,939 maunds, valued at nearly 60 lakhs of Rupees.

5. Now I have every reason to believe, from the rough Estimates already received of the returns for the present year on the Ganges Canal, that the water rate will be considerably in excess of double the above. Assuming it then to be only double, and that a

[*P. W. Dept.*] corresponding amount of grain in proportion is produced, we should probably have thrown into the market 42,40,548 maunds of grain, and have covered not less than 600 square miles with cultivation, irrespective of the sugar and cotton crop during the year of 1860-61.

6. The effect of throwing 42,40,548 maunds, or 16,96,21,920 seers, or 339,243,840 lbs. of grain into the market during such a calamitous season as the present, will be fully appreciated when it is remembered that each lb. will amply feed one man, or perhaps one woman and one child daily. Thus the above quantity of food, which could not otherwise have been produced this year, will have saved 339,243,840 men for one day, or 464,718 men, 464,718 women, and 464,718 children for a whole year; it will have produced fodder sufficient to keep from starvation the cattle of the districts through which the canal has passed; it will have caused a circulation of coin to the amount of not less than 120 lakhs of Rupees, 1,200,000 Pound Sterling,* it will probably have saved the Government from making remissions of land revenue to the amount of 18 or 20 lakhs of Rupees at the very least, and it cannot fail to produce a very great impression on the minds of the people who will thus have been saved from starvation and misery, and to make them happy and contented, instead of being miserable and driven to commit crime, as they otherwise would have been.

* *Note.*—The Ganges Canal had cost, up to the 30th April 1860, 1,826,387 Pounds Sterling.

7. But besides these beneficial results of the Ganges Canal, the means afforded to the community of transporting grain from the Lower Provinces has been very much acknowledged and taken advantage of. The boats plying the canal at the commencement of the year have been doubled within the last six months; new boats are being built daily, and such, I am told, are the profits, that though prices have risen much, the value of the boat is in a very short time recovered. The Ganges Canal Navigation Company are about to call a Meeting for the purpose of building 100 new boats, and though this great demand for water carriage may not be permanent, yet the great stride which navigation as also irrigation has made this year, must, to a great degree, be lasting.

8. I calculate that the total returns of the Ganges Canal during the year 1860-61 will not be less than six lakhs of Rupees.

APPENDIX F.

[*P. W. Dept.*]

Memo. by Capt. J. P. Beadle, on Roads, &c., in Cuttack.

From LIEUT. COL. C. B., YOUNG, *Secy. to Govt. of Bengal, in the P. W. Dept., to Offg. Secy. to Govt. of India, P. W. Dept.,—No.* 2010, *dated* 23*rd May* 1860.

I am directed to submit, for the consideration and orders of the Government of India, copy of a Memorandum* drawn up by Captain J. P. Beadle, late Superintendent of the Embankments, regarding the roads in the Districts of Cuttack and the Tributary Mehals, as also on the water communications leading through part of these Districts and Hidgellee.

* (No. 663 of 30th June 1859, with a Plan.)

2. The Lieutenant Governor considers that the time has not yet arrived to take up the canals proposed, but they will be held in mind; and Captain Beadle, he thinks, deserves much credit for the attention he has given to so interesting a subject.

3. The suggestions regarding the district roads have been referred to the local Officers for report, and will be considered in the next Annual Budget.

Memo. to accompany and explain the Index Map submitted with Supt. of Embankment's No. 663, *dated* 20*th June* 1859.

The great Juggernath Road is the road from Pooree through Cuttack and Midnapoor to Bissenpoor, which was on the old Grand Trunk Road, but is now on the road to Bancoora. The construction of this road originated in a donation by Rajah Sookmoy Roy of one and a half lakh of Rupees. It was commenced in 1822 and completed in 1830, at an aggregate expense of Rs. 15,21,696, or Rs. 5,415 per mile. *Six Serais and three Staging Bungalows* were built up to 1839-40 at an expense of Rs. 61,368, and the annual repairs, including value of convict labour, averaged up to that year, Rs. 28,166, or Rs. 108 a mile nearly.

This road from the Mahanuddy to the Soobunreeka is in the Balasore Division of Embankments, and has consequently come under the Superintendent of Embankments, to prevent the Executive Engineer being under two Superintending Engineers.

The road from the Soobunreeka to Midnapoor is under the Executive Engineer of the Midnapoor Division and Superintending Engineer of the 2nd Circle, and from Midnapoor to Bissenpoor it is under the Local Ferry Funds, and is a metalled road for 30 miles out of Midnapoor, and perhaps the finest road in Bengal.

The whole outlay, with exception of the Rs. 1,50,000 above alluded to, was borne by the State, and the road has never afforded any direct returns to Government for the money expended, except at the Ferries which are under the Magistrates.

The Midnapoor and Oolobarriah Road was commenced in 1826 and completed in 1830, at a cost of Rs. 72,090-13-4. The annual repairs up to 1839-40 averaged Rs. 2,078. This road was employed for the conveyance of the Madras and Bombay Mails, and is used by parties proceeding to Juggernath from the Eastern Provinces.

[*P. W. Dept.*] There are no direct Returns except for Ferries which are under the Magistrates. The Ferry Fund Committee metalled about 18 miles of this road out of Midnapoor. It was then made over to the Public Works Department, since when about five miles more have been metalled.

E. The road from the great Juggernath Road to Balleapal on the Soobunreeka is a fair-weather road, recently formed by the Collector of Balasore, and this Department has been asked to continue the Contai and Ramnuggur Road to the Soobunreeka (F.).

G. The road from Belda on the great Juggernath Road to Agrachour is a Ferry Fund Road that is now being reconstructed. It will be a fair-weather cart-road. The remaining portion of this road (H.), and the other roads from Contai to Ramnuggur and to the Russoolpoor River, are excellent fair-weather roads, 14 feet wide, raised and bridged as far as the small water-courses and drainage channels are concerned. They were originally formed by the Salt Department; but since the Embankments were transferred to this Department, they have been maintained and improved by the Embankment Officers, and have recently been reconstructed together with the Embankments. The continuations of these roads in North Hidgellee were formed and have been maintained in a similar manner, but the Bamtghur and Nurgha Road (K.) has not yet been reconstructed. In former days it led to Tumlook, but the road north of Nurgha is nearly obliterated. The other roads also are at present only Postal routes.

C. is the Pertaubkhallee and Narainpoor Salt Canal, and is navigable for some months of the year; but the Salt Department maintains a dam at the Roopnarain, and during the season of manufacturing.

D. is the Banka Canal, which is navigable throughout the year, except during the time when it is being excavated. Neither of these khals have been cut deep enough to be thoroughly useful and complete water routes. Two Tables of the tolls collected on the Banka Canal during periods of ten years are annexed.

H. is a cut that can easily be made, and I. is a very short cut which will lead the boats into the Hooghly above Fulta.

B. is the old silted up Oolobarriah Canal, and A. is a cut which, if completed, would make a navigable route between the Roopnarain and Damoodur, connecting Guttal on the Selai by a tidal navigable route to the Presidency.

From Gurbetta on the Midnapoor and Bissenpoor Road, there is a fair-weather road viâ Keerpoy to Guttal under the Local Ferry Funds. Portions of this road are good, and if the route were completed to serve as a good fair-weather road, it would be of great service to the District.

The old Burdwan Road has been recently remembered, and is now being greatly improved. A more favourable country for a line of road does not exist. The Local Committees are at work upon it, but it has been long neglected. As a portion of the Moorshedabad and Juggernath route, and as connecting the Railroad with the South-Western Provinces, it is of much importance.

The road from Midnapoor to Panchkoora on the Cossye River is metalled, and the continuation to Tumlook, 16 *miles*, which is the route always taken by the traffic, should also be metalled. [*P. W. Dept.*]

The Canals C. and D. which already exist as navigable channels connect the Roopnarain with the Huldee.

On the 15th May 1839 the Government sanctioned an expense of Rs. 23,138-0-4½ for the deepening of a khal in Hidgellee leading from Tauropukoriah to Kalee Nuggur on the Huldee and Russoolpoor; this is the water route marked III. The khal was opened by the Salt Department, and allowed to silt up. An extract from the present Salt Agent's No. 131, dated 7th June 1859, remarking upon this work, is appended.

The water route marked IV. can be easily formed as the tide serves up to the Contai and Agrachout Road in the deep channel of the Russoolpoor River, and the ground between this point and the Soobunreeka is low and swampy for a long distance at both ends. A section of the land will be taken next season.

This series of Canals (I., II., C. or D., III. and IV.) would connect the Balasore Road with Calcutta by a direct water route from the Soobunreeka, and the difficult portion of road crossing the Valley of the Soobunreeka would be avoided; but there is every natural facility for connecting the Soobunreeka with Balasore on the Burra Bolong by a Coast inland tidal, Canal V., if this further measure be considered advisable, which will do away with the great Engineering difficulty of the Valley* which the Juggernath Road crosses north of Balasore.

* Nooniajoory.

I have addressed the Commissioners of the Burdwan Districts and of Orissa on the subject of this proposed water route, which would find great favour in the eyes of the people, and bring in, I believe, a remunerative revenue, which the Midnapoor Road, 50 miles longer, never will do.

The cost of keeping the canals open would not exceed the cost of maintaining a completed metalled road in order, and the first expense would not be greater than that of completing the Balasore and Midnapoor Road. My own belief is, that the natural route for Orissa produce is through Hidgellee and by tidal canals.

In 1839-40 the Military Board reported that the clearance of the Oolobarriah Canal costs about Rs. 1,321, and that the Tolls levied on boats using the canal have averaged Rs. 2,092 for the last two years.

I append a Statement of the Tolls received on the Banka Canal (between Huldee and Roopnarain) during two distinct periods of ten years each.

To sum up my proposals—I would recommend that the Balasore and Midnapoor Road be not completed, but that a water route from the Soobunreeka through Hidgellee and the Salt Aurungs, be opened out to the Hooghly River between Oolobarriah and Fulta, to be extended afterwards from the Soobunreeka to Balasore on the Burra Bolong River, and that the road from Balasore to Cuttack be completed, with exception to bridging the great rivers.

* [*P. W. Dept.*]. Further, that the Culna and Oolobarriah Canals be made navigable, and a water route be thus provided from Ghuttal to the Presidency, as well as a canal for the coal boats passing from the Damoodur into the Hooghly; also that the road from Panchkoora to Tumlook be metalled.

In respect to the Ferry Fund Roads, I would recommend that the old Burdwan Road to Midnapoor be made a good fair-weather road, and that the road from Keerpoy to Ghuttal, and from Keerpoy to Gurbettah, be completed as good fair-weather roads, as also the road from Belda to Agrachour.

All this work is in progress, and the Secretaries of the Ferry Fund Committees are very anxious about these roads.

There will be then three roads from the great Juggernath Road as a base connecting it with the water routes to the Presidency—

With Balleaghye in Hidgellee. With Tumlook in Midnapoor. With Ghuttal in Hooghly.	All places of importance, up to which the tides serve, and from which easy safe water routes will be afforded to the Presidency.	Central line metalled.

The old Trunk Road from Howrah to Bancoora is shown in the Index Map. It is not connected with the Orissa and Midnapoor Lines, and therefore I do not advert to it. It is maintained as a fair-weather road by the Ferry Fund Committee, and there is a great deal of traffic on it, the greater part of which will probably take the Ghuttal land and water route to Bancoora when the roads are improved, and the water route to Ghuttal is opened out by the Oolobarriah Canal.

It is not only the produce of Orissa that will be placed in communication with the Presidency by these water routes, but the River Soobunreeka, at present little known, will be brought under notice. I have perhaps exalted ideas about this river, but it is certain that timbers, firewood,* charcoal,* and gooting lime-stone will be supplied to the Presidency from its banks, directly the Hidgellee inland water routes are opened.

* These are very important items; to increase the supply and cheapen the rates at the Presidency is a great object. The Tolls on charcoal alone would, I am convinced, pay for the maintenance of the canals.

The lands yield a fair profit to Gold-washers. A Calcutta Company has for some years been working at Copper Mines in its vicinity. Ochreous clays taken from its banks are sold to Pilgrims on the Juggernath Road, and, if I mistake not, good fire-bricks can be made from them. The river's course lies through an uncivilized country that will profit much by the enterprise of traders: its water is delicious, and the Preventive Salt Officers' Bungalow at Jellasore is noted for the salubrity of its situation on the immediate bank of this beautiful river.

Statement of the actual expenses incurred for bunding and clearing out of the Bunka Nullah, also of the Tolls collected for the last ten years. [P. W. Dept.]

Expenses for the reparation.				Profit during ten years, Rs. 70,149-13-6.	Tolls collected.			
	Rs.	A.	P.			Rs.	A.	P.
In the year 1815-16	1,295	12	3		For the year 1815-16 ...	8,800	8	10
" 1816-17	1,337	15	8		" 1816-17 ...	8,284	5	1
" 1817-18	1,655	5	5		" 1817-18 ...	8,452	14	1
" 1818-19	1,384	9	11		" 1818-19 ...	9,448	3	0
" 1819-20	1,170	14	0		" 1819-20 ...	9,590	10	11
" 1820-21	1,478	11	9		" 1820-21 ...	8,846	5	1
" 1821-22	1,488	9	7		" 1821-22 ...	7,516	14	0
" 1822-23	1,637	12	5		" 1822-23 ...	7,888	14	11
" 1823-24	1,572	6	7		" 1823-24 ...	8,134	15	7
" 1824-25	1,746	4	4		" 1824-25 ...	7,954	7	11
Total ...	14,768	5	11		Total ...	84,918	3	5
Annual Average ...	1,476	13	5		Annual Average ...	8,491	13	2

A Statement of the Banka Nullah Collection.

Year.	Amount of Tolls collected.			Tonnage of Boats employed in the transportation of Salt from the Aurungs to Ghat Narainpoor Golahs, on which Toll is not levied.	Remarks.
	Rs.	A.	P.		
1847-48	8,672	0	5	Upwards of 3,000 Tons on an average, at Re. 1-1 per 100 Maunds, Rs. 892-8, or for 11 years—	In the six years previous to 1847-48, the receipts only averaged Rs. 3,102, whilst the excavations cost Rs. 2,007.
1848-49	6,729	6	0		
1849-50	2,545	13	0		
1850-51	1,860	14	9		
1851-52	1,717	11	9	Rs. 8,925 0 0	
1852-53	1,741	10	0	" 892 8 0	
1853-54	1,454	13	6		
1854-55	1,885	4	3	Rs. 9,817 8 0 for the Government Saltpassed through.	
1855-56	3,085	9	0		
1856-57	3,628	1	9		
1857-58	3,865	11	3		
Total ...	37,186	15	8		J. P. Beadle, *Capt., Supt. of Embkts.*
Annual Average ...	3,718	11	2		

Extract of a letter from the Salt Agent of Hidgellee, to Supt. of Embankments,—No. 131, *dated 7th June* 1859.

Para. 5.—" With reference to your enquiry regarding the old Canal " Pautgoda" * being the more direct and safer route for boats from Hidgellee to Calcutta, I have to inform you I find that the canal was excavated in 1841 at an expense of Rs. 29,000, sanctioned by the Supreme Government. It was open only two or three years, during which time the traffic was great.

* Kalee Nuggur, on the Russulpoor River, to Tarrapookea, on the Huldee on Balleaghye.

J. P. Beadle, *Capt., Supt. of Embkts.*

[*P. W. Dept.*] It is stated by parties who were acquainted with the circumstances, that the silting up of the khal in so short a time was attributed to the work not having been properly done. It would doubtless be a great boon to the people in the south and east of the Midnapoor District if the canal were again navigable, and I see no reason why the failure on the former occasion should cause discouragement as to the success of the work.*

Memo. by CAPT. J. P. BEADLE, *Supt. of Embankments,—dated* 30*th June* 1858.

I am so interested in this subject of inland navigation that I cannot sign this without remarking that the Banka Canal was opened out as a speculation and for profit to himself by a Mr. Kebles in 1782, who had a grant to collect tolls for 21 years, renewable at expiration of term on payment of a consideration. In 1801, however, Government ordered compensation to be made instead of renewal, and that the collection of tolls should be put under the Collector of Midnapoor. It is not too much to suppose that the speculator made 1½ lakhs of Rupees by his canal.

If we turn now to Madras, we find that in 1801 the Government of Madras planned a canal to connect Madras with the remove back-water and Pulicut Lake (the canal was afterwards extended to that lagoon), and invited tenders for the execution of the work, which were taken up by a Mr. J. L. Heefke and Mr. Basil Cochrane, who had exclusive possession of the canal for 45 years, with right to levy tolls at rates laid down. The work was completed in 1806, and in 1837 transfer of possession was made to Government; Government engaging to pay the average yearly net profits from the canal during the preceding 11 years, Rs. 14,061-11-7, for the remainder of the time the engagement had to run. Even paying this heavy annuity for the 10 years that it was due, the Government had a clear gain of Rs. 10,005 yearly, and during the next four years, when there was no compensation to pay, the net gain was Rs. 29,521 annually, and the Government derived during the 14 years a clear profit from this canal of Rs. 2,22,915.

By far the greater part of the traffic on this canal is the transport to Madras of *firewood* from the jungles on the eastern side of the lake, and of Cockle shells, which are carried to Madras to be converted into fine plaster.

The canals in the Salt Aurungs of Bengal require no Steamers. Boats will be carried through by the tides, and if the canals are properly and scientifically made, so as to make the land drainage a point in clearing the silt out, and to avail of the fall at low water to have a scouring action, I believe they can be maintained at a large net profit in addition to the improvement of the districts and the reduction of rates on many articles.

From Offg. Secy. to Govt. of India, P. W. Dept., to Secy. to Govt. of Bengal, in the P. W. D.,—No. 3423, *dated* 9*th July* 1860.

I am directed to acknowledge the receipt of your letter No. 2010, dated the 23rd ultimo, forwarding a Memo. by Captain Beadle, regarding the roads in the Cuttack

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* There were reasons for this canal silting up, as well as for the heavy expenditure; in excavating the existing canals, they have *never been cut deep enough*.

I have also, with the assent of the Revenue Board, put a stop to the construction in future years of dam heretofore annually erected by the Salt Department across the Balleaghye (upper reaches of Huldee River), which must have greatly assisted in silting up the Pautgoda Khal.

District and the Tributary Mehals, as also on the water communications leading through [*R. W. Dept.*] part of these Districts and Hidgellee.

2. In reply I am desired to state that His Excellency the Governor General in Council is very sensible of the value of the suggestions and importance of the works proposed by Captain Beadle, and that His Lordship in Council fully concurs in the commendation bestowed on that Officer by the Hon'ble the Lieutenant Governor. I am also to add, that any suggestions for giving effect to the plans laid down, will be received by the Government of India with much interest, and with every desire to give effect to any matured project which may be approved by His Honour.

[P. W. Dept.]

APPENDIX G.

From MAJOR E. K. ELLIOT, *Commr. of Nagpoor, to Secy. to Govt. of India, P. W. Dept.,—No.* 69, *dated 4th June* 1861.

With reference to the papers noted on the margin, respecting the supply of Indian Cotton to England, I have the honour to transmit for the perusal of His Excellency the Governor General of India in Council, a copy of the correspondence quoted in the annexed list, wherein will be found some information of a miscellaneous character, bearing on the subject now attracting so much attention. I have also to observe as follows for the consideration and orders of His Excellency in Council.

Resolution in the Home Department, dated 28th February 1861.
Secretary to Government in the Home Department, to the Commissioner of Nagpoor, No. 446, dated 28th February 1861.
Extract from the Proceedings of the Right Hon'ble the Governor General of India in Council, in the P. W. D., under date the 1st April 1861.
Received on the 10th idem, under docket No. 980 A.

2. A large quantity of cotton is grown in this Province, and there is little doubt but that this quantity will steadily increase. Hitherto, the trade may have been retarded in consequence of the difficulties of transport from bad roads, or rather no roads at all, and from the transit duties of the old Native Government, continued, until very lately, under our rule.

These duties have now ceased to exist, whilst measures are in active progress for the improvement of our roads. The principal outlets for the cotton from this Province generally known and most in use have been by Jubbulpoor to Mirzapoor and by Nachengaon (near the Wurdah Rirver) or Oomraotee to Bombay.

One hundred miles of the Great Deccan Road is under construction as a 1st Class Imperial Road, and when completed, the transport of cotton will be facilitated in either direction; but the feeders to this and the Southern line from Nagpoor towards Hyderabad,† with a branch to the Sudder Station of Chanda, which runs through a cotton-producing country the whole way, should also be taken in hand and improved.

* *Note.*—The Great Deccan Road runs from Mirzapoor on the Ganges, through Jubbulpoor, Nagpoor, and Jaunah to Bombay. One hundred miles run through this Territory.

† *Note.*—The boundary of the Province in this direction is at Patara, on the Wurda. The Branch to Chanda leaves the line at Wurrorah, the Head Quarters of a Tehseeldaree Station, about 7 miles short of the river.

3. Of the five districts into which this Province is at present divided, two, Chindwarra and Bhurtiarra, produce little or no cotton. The principal cotton-growing districts are Nagpoor, Chanda, and Raepoor, in the order in which they are named. The quantity produced may be roughly estimated at 20,000,000 lbs.,‡ of which about 9,000,000 lbs. are, it is said, from the Nagpoor District. It is the Nagpoor and Chanda Cotton alone which finds its way to Mirzapoor and Bombay, that from Raepoor, which is stated to be of a coarser description, going to the Eastern Coast, or being consumed within the Territory, or before it reaches the Sea.

‡ *Note.*—200,000 bales of 100 lbs. each, or half that number of bullock loads. It is supposed that upwards of 50,000 bullock loads leave Hingunghat and that part of the Nagpoor District annually.

4. In the Sketch Map attached to Colonel Maxwell's letter, and accompanying the correspondence, the main lines of communication through the Province are shown. The most important, as affording the means of transport to the ports of shipment, are, as regards cotton, the Great Deccan and the Southern lines. On a rough calculation, the mileage of the feeders to these lines requiring to be opened out and improved in the Nagpoor and Chanda Districts, may be estimated to extend over 300 miles, and with a little exertion, and the requisite aid in money, much may be effected during the ensuing working season. [*P. W. Dept.*]

5. After the lapse of the Province in 1853-54, a one per cent. Road Fund was established in each district, from which very little has hitherto been expended, so that the accumulations on the past years now amount to something considerable.*

* *Note.*—A detailed Report on the Road Fund has been submitted in the Foreign Department, and rules prescribed for its future management.

A portion of these accumulationss may, I think, very properly be expended in opening out these district lines; but without the aid of Government, no material improvement can be effected. A reference to the letter from the Chief Engineer, accompanying this Report, will show that in his opinion a sum of not less than Rs. 200 per mile would be needed to make these lines passable, or to put them on the footing of fair-weather roads. I would go further than this, and suggest an expenditure of Rs. 250 a mile, a sum which has, I am told, been allowed on other occasions for making fair-weather roads. For 300 miles an outlay to this extent would require funds amounting to Rs. 75,000, out of which sum the District Road Funds might fairly contribute one-third, or Rs. 25,000. With the number of projects now on its hands, the Department of Public Works could not possibly undertake this additional task unaided, and I would propose to obtain the co-operation of the Committees for local improvement, already formed in each district. To add to the efficiency of these Committees, and to forward the efforts of the District Officers, some direct executive assistance might with advantage be provided, the present agency of the Department of Public Works not being strong enough to afford more than its professional advice and instructions; I would urge, therefore, that, as recommended by Colonel Maxwell, a qualified Native Surveyor should be appointed to each district, to be placed under the orders of the Local Committees, their salaries being defrayed from the Road or other Local Funds.

6. The foregoing project has reference solely to the Nagpoor and Chanda Districts. In Raepoor, the opening up of the communications with the neighbouring territories would also, I feel assured, be attended with the greatest benefit to the Public at large, as well as to the district itself, notwithstanding the statement of the Officiating Deputy Commissioner,† that "no complaints are made of the want of well made roads being any obstacle to the traffic."

† Letter No. 186, dated 16th April 1861, para. 7, copy accompanying.

From its distance from all the lines of ordinary travel, this district is almost unknown, except in name, beyond its own borders. With the exception of the one line ‡ running east and west towards Cuttack and Nagpoor, there may be said to be no

‡ *Note.*—This is to be a 2nd Class road, extending from Bishnoor on the Wurda, towards Oomrotee, and running through Nagpoor, Bhundarra, and Raepoor, to the Junk Nuddee, in the direction of Sumbhulpoor and Cuttack.

The residents of Raepoor get their letters from Calcutta viâ Cuttack and Sumbhulpoor. It is the "old Raepoor Post road."

[*P. W. Dept.*] main road in the district, and the difficulties of transporting its varied produce to distant marts, leaves little more than nominal prices for the producer in the majority* of instances. The capabilities of this fine district are very great, not only from the growth of cotton, but also from grain of every description, oil seeds, lac, koosum, &c., &c., and I am convinced that with improved communications, the present Land Revenue (between five and six lakhs) might in a very few years be more than doubled.† The only portion of its produce which finds its way out of the Province is, that taken by Binjarries by a track almost unknown, save to themselves, to the Eastern Coast, as described by Captain Saxton in his letter of the 21st March last, No. 357, a copy of which accompanies this Report.

* Arrangements are in progress for completing the communication between Raepoor and Jubbulpoor over the Rajadhar or Chilpee Ghats.

† *Note.*—The introduction of the Survey into the Raepoor District is most desirable. The extent of culturable land, that of the first quality, is reported to be very great, but with a little more than a nominal value for produce from the want of outlets. An improvement in the lines of communications should be simultaneous with a proper assessment on the land after survey. The produce of Chutteesgurh in distant markets would realize sums which would amply repay the landholders for bringing the lands now waste under cultivation, whilst their extent with a liberal margin would greatly raise the present assessment. Nothing, however, can be attempted until the measurement of the lands can be effected.

This track appears to deserve more attention than it has hitherto received. From Captain Saxton's account, indeed, its being at all passable is owing to the efforts of the Rajah of Kalahundy or Kharondh (a Dependency of this Province), and I purpose to invite him to meet me at Chanda during the ensuing cold season, with the other Chiefs and Talookdars under the jurisdiction of the Deputy Commissioner on the Godavery, and to endeavour to keep up his interest on this road by pointing out the advantages that must accrue, not only to the District of Raepoor, but also to his own Estates, by its being established as a permanent line; at the same time, I would gladly have it in my power to assure him of funds being forthcoming to improve the line, and make it at once a good fair-weather road, travellable at all seasons. In effecting this object, the Rajah's co-operation and assistance may be turned to account. He would in his own Ilaqua obtain labour much cheaper than we could.

I have requested Captain Saxton to furnish me with a Sketch Map of the country through which this road passes, as well as with any further information he may possess regarding it, with a view hereafter of proposing its permanent construction (on such a scale as may be found necessary) after examination and survey as a branch of the present eastern line from Nagpoor through Raepoor to Sumbhulpoor and Cuttack.

The road is clearly deserving of serious attention, not only as an outlet for the produce of the Raepoor District, but as an inlet for salt imported from the Coast in large quantities, and which will increase with the facilities for its transport. It appears to me also that this route would be better adapted for troops moving between this Province and the districts in the Madras Presidency on the Eastern Coast, than the more circuitous one now in use via Sumbhulpoor, the Ghat on which line is described as a very difficult one.

Note.—The Deputy Commissioner of Raepoor estimates the income from the tax recently imposed upon salt, at a lakh of Rupees.

7. In conclusion I would solicit the favourable consideration of His Excellency in Council to the project explained in the 5th para. of this letter, as a means of expediting, at no great cost, the transport to the ports of shipment of cotton grown in the Chanda and Nagpoor Districts, in localities off the main lines of road, and yet at no great distance from them. [P. W. Dept.]

8. I would refer also to the concluding passage of the Chief Engineer's letter under transmission. Colonel Maxwell's opinion on the subject is in accordance with my own. If the parties most interested in the Cotton Trade were to establish agencies in this part of the country, and introduce a proper system of pressing and packing, and create Establishments for providing the requisite carriage, the supply would very soon equal any demand that might be made. With improved communication and increased facilities for transport, this Province and the neighbouring districts north and south would very soon produce any amount of cotton which could possibly be required.

9. Annexed is a Table showing the prices realized this year at Bombay for cotton from Hingunghat, Oomraotee, and Arwee, including the cost of its transit from the places named.

From Depy. Commr., to Commr. of Nagpoor,—No. 296, *dated* 20*th September* 1860.

With reference to the Circular letter from your Office noted in the margin,* and the subsequent Memos. regarding it, transmitting a printed copy of a Despatch from the Hon'ble Court of Directors in the Revenue Department, dated 22nd July 1857, No. 10, calling for specimens of the cotton plant, and information regarding its culture, &c., &c., I have the honour to forward specimens of the plant, its produce, and the soil it is grown on, as enumerated marginally,† and to report as follows:—

* No. 23, dated 30th March 1858.

† 1. Packet of Soil.
2. " "
3. " "
4. " "
5. Specimen of Plant.
6. " of Flowers.
7. " of clean Cotton.
8. " of Cotton Seed.
9. " of uncleaned Cotton.

2. The soil upon which by far the greatest quantity of the cotton of this Province is grown, is that known all over India as the black cotton soil. It is extremely light and naturally rich, and requires very little manure, and, as a rule, gets none. The poorer kind of soil in which cotton is sometimes grown, is a mixture of this with a greyish earth and a quantity of lime-stone, and if this is situated near the village, it is sometimes manured.

3. The black soil or loam varies in depth from 1 foot to 20, and sometimes more; as a general rule, it is not much infested with weeds.

4. The cotton is sown in the commencement of the rains, immediately after the first fall, or from the middle of June to the middle of July, according to the season; it is occasionally planted in alternate rows with dall or toor, but mostly by itself; no artificial irrigation is employed, and with the exception of running a plough through between the rows of plants, to throw the earth up over the roots once when the plants have attained a few inches of growth, they are left to shift for themselves. The plant flowers in October or November, the picking commences in December, and goes on to the end of

[*P. W. Dept.*] February or middle of March; in good seasons the produce will yield a return of from 10 to 20 fold, while in inferior soils it seldom yields more than from 4 to 5; that is, supposing a maund weight of seed to be sown, the produce would be from 10 to 20 maunds in good, and from 4 to 5 maunds in indifferent land; but of this, on cleaning the cotton, three-fourths would be seed, so that for a maund of seed the produce in cleaned cotton would only be, off the best land, from 2½ to 5 maunds.

5. The black soil, in which the best cotton is grown, is the most fertile in India, and on it, in other localities, are produced the finest wheat, toor, jowarie, and other dry crops; it seldom, as before mentioned, is manured, and does not seem to require much deepening. It is usually turned up to the depth of 6 or 8 inches once or twice after the first showers in June, and then the seed is put down.

6. The seed used is that commonly produced in the country, and the character of the plant is herbaceous, and its average height may be put down at 36 inches, the spread of the branches being about 12 to 15; when the picking is over, cattle are turned in to graze on the leaves and more tender of the branches; and the stalks are in many places, where wood is not procurable near at hand, cut down and used by the poorer classes for fuel.

7. To the geological character of the district, I am unable to speak. The main feature of the cotton-growing portion of it is about 1,000 feet above the level of the sea, and is naturally well drained.

8. The rains usually commence early in June, and continues, with one or two breaks of 10 to 15 days each, till the beginning of October. Irrigation is no where employed.

From A. Ross, Esq., *Supt. of Survey and Settlement, to Depy. Commr. of Nagpoor,—No.* 91, *dated* 3*rd April* 1861.

With reference to the Notification lately issued by Government and seen by me in the newspapers, regarding the production and transport of Indian Cotton, I beg to hand you a Statement which I have had compiled from the Survey Khusrahs, showing the extent of cotton cultivation in the several Pergunnahs of the Nagpoor District.

2. I am afraid that observations from me, which your own superior local knowledge may render superfluous, will appear out of place; yet, as an accompaniment to the skeleton map forwarded herewith, showing the relative positions of the several Pergunnahs, I would remark that the great bulk of the cotton-producing lands is in Pergunnahs lying on the eastern and southern confines of the district, and the produce therefore does not require long transport through it, whether the line of exit be to Bombay viâ Berar, or to Madras viâ the Godavery. Ashtee, the western portion of Anjee, Nachengaon, Undoree, and Pohna, are all in the flat open country constituting the valley of the Wurdah; while Pownar and Hingunghat also occupy a comparatively champaign tract. Katal, Kondalee, and Kailjhur are the three largely producing Pergunnahs that most require improved means of intercommunication. Main roads run through all three, but the country is, as you are aware, hilly and difficult in the extreme. Anjee is also hilly to the east, but the ranges of hills from valleys traversable without much difficulty.

3. It will be seen that 281,214 acres or 439 square miles of the Nagpoor District [*P. W. Dept.*] are under cotton cultivation. My enquiries give two khundees as the produce of one "khundee" of land. I take the "khundee" to be a measure of eight acres, and the weighment of produce being made by the cotton-seer of Rs. 24, the produce of one khundee or eight acres is 12 maunds by the seer of Rs. 80, or one maund and a half per acre. Of this produce one-fourth is cotton-wool and three-fourths seed, so that the produce of each acre may be estimated at 15 seers or 30 lbs., and the total yield of cotton-wool, at 8,436,420 lbs., or 58,586 bales—a quantity nearly equal to one-thirtieth of the export from all India to Great Britain during the past year 1859-60.

4. What the proportion may be that has been retained for district consumption, and what exported, is ascertainable from the traders at the great marts of Hingunghat, Nachengaon, and Arwee: but if the entire produce were exported, it would give a traffic of 29,293 bullock loads, each of which, consisting of two bales, weighs 3 maunds 24 seers, or 288 lbs., or of 8,369 cart loads, seven bales being ordinarily loaded on one two-bullock cart.

5. The cultivation of cotton is of course capable of great extension. If you desire it, I shall supply a Memorandum of the quantity of land in each Pergunnah adapted for cotton cultivation, and I will be happy to furnish any other information that my Office can afford.

Statement showing the extent of Cotton Cultivation in the Pergunnahs of the Nagpoor District.

Pergunnahs.	Acres.	Remarks.
Pohna	38,064	Note.—Cotton is not cultivated in Pergunnahs Nagpoor and Ambhora.
Anjee	34,132	
Nachengaon	30,185	
Pownar	21,997	
Kailjhur	21,855	
Undoree	20,070	
Kondhalee...	18,873	
Ashtee	18,198	
Katal...	18,108	
Hingunghat	17,033	
Baila	11,810	
Girur	8,545	
Amnair	7,635	
Kailod	5,116	
Hingna	3,667	
Kulmaishwur	3,400	
Boree	1,495	
Oomrair	514	
Patunsaongee	267	
Bhewgurh	135	
Kharsa	77	
Ramtaik...	38	
Total	281,214	

[*P. W. Dept.*] *Prices of Cotton at Bombay.*

Description of Cotton.	Cost per lb., according to one account.	Cost per lb., according to another account.	Average cost per lb.
	As. D.	As. D.	As. D.
Hingunghat Cotton ..	3 or $4\frac{1}{2}$	$2\frac{11}{14}$	$2\frac{9}{12}$ equivalent to $4\frac{1}{8}$
Arwee and Oomraotee Cotton	$2\frac{10}{12}$ or $4\frac{1}{4}$	$2\frac{11}{14}$ or $3\frac{1}{8}$	

One of the sources of information from which the above is derived, gives the average price for this year at Bombay, of Hingunghat Cotton, at Rs. 145 per load of 784 lbs., and of Arwee and Oomraotee Cotton at Rs. 138, for the same quality.

Another gives Rs. 140 per load of 864 lbs. as the average price of both descriptions.

In these sums is included the cost of transit to Bombay, which this year has risen from Rs. 24 to Rs. 42 for the quantity carried, while the cotton itself at Hingunghat is stated to have advanced in price from Rs. 27 to Rs. 35 per bojah, or bullock load of 268 lbs.

The facts are significant of the times.

From Secy. to Govt. of India, P. W. Dept., to Commr. of Nagpoor,—No. 2152, *dated* 21*st June* 1861.

In your letter No. 69, dated 4th June, you propose to expend Rs. 75,000 in making District Roads, as feeders to the main roads now under construction. You estimate that this sum will make 300 miles of such road, at the rate of Rs. 250 a mile; you propose to provide Rs. 25,000 from the Local Funds, and to put the work in the hands of the Local Committees, and you would place at the disposal of each of them a qualified Native Surveyor.

2. I am directed to say that the Local Funds are at your own disposal to expend to any extent you may think desirable on the District Roads. The only regular source of supply for Native Surveyors is the Thomason College at Roorkee. You should place yourself in communication with the Principal, through your Chief Engineer or otherwise.

3. In the orders of Government of the 1st April, No. 980 A, authority was given to you to expend Rs. 100 per mile in improving the existing tracks of the Great Deccan Road to facilitate the export of cotton. It was intended to make provision for this in the Budget, but the matter was overlooked in issuing the Budget Orders. The amount would have been Rs. 10,000. I am directed to state that, to meet the sum available from Local

Funds, you may draw this Rs. 10,000 from the extra lakh lately assigned to Nagpoor, for the purpose of opening out feeders as you propose, and you may add to the contribution from the same source. But I am to request that you will report how much out of the lakh it will be expedient to take, bearing in mind that the addition of that lakh to your year's assignment was made chiefly in view to the more vigorous prosecution of the permanent trunk lines. [*P. W. Dept.*]

Memo. by MAJOR E. K. ELLIOT, *Commr., on Roads in Province of Nagpoor,—dated 12th June* 1861.

Before proceeding to consider the detail of a scheme of roads for the Province, it appears desirable to say a few words on the Territory itself. A reference to the accompanying Map will show that the Province is of a triangular form, its extreme length from north to south being about 382 miles, and its breadth in the widest part of it 310 miles, exclusive of the detached Principality of Kharond or Kalahundee on the east, which is 92 miles broad by 90 in length. Nagpoor is bounded on the north by the Districts of Hoshungabad, Nursingpooor, Seonee and Mundlah, belonging to the Jubbulpoor Division, and the Sirgoojah Rajah's Talooks. On the east by a portion of the Sirgoojah Talooks and Ramghur, and by the numerous petty States belonging to Chota Nagpoor and Sumbhulpoor; by a tract of about 30 miles belonging to Independent Hill Tribes (Khonds) in the District of Ganjam, in the Madras Presidency, and by the Territory of Jeypoor, also under the Madras Government. On the south by the River Godavery, the Talook of Elmawur, belonging to the Nizam of Hyderabad, and by a portion of the Wurngunga, Pranheta, and Wurdah Rivers. On the south-west and west by the River Wurdah, which divides it from the Nizam's Dominions, and by the District of East Berar, and portions of Baitool and Hoshungabad in the Jubbulpoor Division.

2. The first step in arranging a scheme of roads is to classify them in the order of their importance, and this may be done under the three headings—

Imperial,
Provincial, and
District.

3. The Imperial lines are those in the construction and maintenance of which the interests of the State preponderate, as lines of Military communication, or for advancing the commercial interests of India generally; the Provincial lines standing to the Province, and the District lines to the several districts, in the same relation as the Imperial lines do to the Empire at large, each being intended in its own degree for the improvement of the country and the better development of its resources.

4. The Provincial roads would act as feeders to the Imperial lines, whilst the district roads would perform the same office to both Imperial and Provincial lines.

5. The cost of the construction of the Imperial lines would be borne by the Imperial Revenues of India, the cost of the Provincial lines being defrayed by the Imperial and Local Revenues conjointly, in proportion to their general or local importance, leaving the outlay required for District lines to be borne by local funds alone, save in instances where Imperial projects may be materially furthered and expedited, when the Imperial funds might be charged with a quota of the expenditure.

[*P. W. Dept.*] 6. A glance at the Map of India will show that from the position of Nagpoor with reference to the four Presidencies of Bengal and Bombay, Madras and the North-Western Provinces, the main Imperial line must be the one known as the Great Deccan Road, which, leaving the Grand Trunk Road from Calcutta to Lahore at Benares, crosses the Ganges near Mirzapoor, and passes viâ Jubbulpoor and Seonee through Nagpoor to Jaulnah, Ahmednuggur, and Poona, connecting Calcutta with Bombay. This line enters the Nagpoor Territory about 49 miles south of Seonee, and passing through the Military Cantonment of Kamptee and the Civil Station of Seetabuldee, the Head Quarters of the Province, leaves it at the River Wurdah, a few miles to the westward of Nachengaon, having a course through the Province of about 104 miles in length.

7. The next in importance is the Southern line, commencing, it may be said, at Agra, and passing viâ Gwalior and Jhansi to Saugor, whence it should be continued through Nursingpoor, entering this territory in the Chindwarra District above the Ghats, and from Chindwarra proceeding by Nagpoor and Hingunghat towards Hyderabad and Madras, thus connecting the Punjab and Delhi through Central India with the Southern Presidency.

No. 64, dated 29th May 1861.

* The length of this line through the Nagpoor Territory will be about 225 miles.

This road might, as suggested in the letter from this Office noted on the margin, well be called the Great Southern Road of Central India.*

8. The third Imperial Line† would be that traversing the Province from east to west, starting from Calcutta and passing viâ Midnapoor, Cuttack, and Sumbhulpoor, through Raepoor, Bhundara, and Nagpoor, towards Oomraotee and Ellichpoor in Eastern Berar. This line joins the Great Deccan Road at Nagpoor, and in conjunction with it, was, prior to 1853,‡ the postal line between Calcutta and Bombay. Since 1853 this line has been superseded by the one viâ Mirzapoor and Jubbulpoor, though a foot dâk is maintained between Calcutta and Nagpoor along the old post road, for the convenience of the residents of Sumbhulpoor and Raepoor, &c.

† This line enters the Nagpoor Territory at the Jonk Nuddee, about 70 miles to the east of Raepoor. It runs for a distance of 320 miles through the Province, leaving it at Bishnoor, on the Wurdah, about 70 miles west from Nagpoor, on the direct road to Oomraotee.

‡ Before the bi-monthly Steamer to Calcutta, the English Mails from Bombay were despatched by the Raepoor Postal Line.

9. We now come to the Provincial lines of road. The first should be a continuation of the road between Jubbulpoor and Mundlah, over either the Rajadhar or Chilpee Ghats into Chutteesghur, with a road from its Sudder Station of Raepoor to the outstation of Belaspoor, Ruttunpoor, and the northern boundary. Again, southward there should be a road from Raepoor through the Bustar Territory (a tributary of Nagpoor) to Sirancha, situated on the Pranheta, near the navigable head of the Godavery, and the site selected for the Head Quarters of the Deputy Commissioner in charge of the six Talooks§ on the left bank of that river, recently ceded by His Highness the Nizam.

§ 1. Sirancha.
2. Noogoor.
3. Cherlah.
4. Albâka.
5. Rakapilly.
6. Budrachellum.

Sirancha should also be connected with the southern Imperial line by a branch viâ [*P. W. Dept.*] Aheree and Chanda to Wurrorah, about 30 miles south of Hingunghat.

10. Another road branching from the east and west (Imperial) line should start from some point (to be determined on hereafter) east of Raepoor, and passing through the Territory of the Rajah of Kharondh (Kalahundy in the Map) be carried through the Jeypoor Estate (belonging to the Madras Presidency) to the sea coast; thus connecting this Province with the ports on the Eastern Coast to the south of Ganjam. This appears from a Report by Captain Saxton, copy of which was forwarded with this Office letter No. 62 dated 4th June 1861. noted marginally, to be the most direct and feasible line for the residents of the eastern portion of this Province to reach the Coast, and its importance in a commercial point of view should not be lost sight of.

11. The next line is one from Seonee (Jubbulpoor Division), on the Great Deccan Road through our northern District to Baitool (also in the Jubbulpoor Division) for the purpose of connecting Chindwarra with Jubbulpoor on the north-east, and Bhopal and Indore through Hoshungabad on the north-west. This line would have about 85 miles of its length in the Nagpoor Province. There is another road, which, though entirely within the limits of the Nagpoor District, is Provincial, if not Imperial, in importance, and should be constructed. It runs between the Town of Hingunghat on the southern (Imperial) line, and Nachengaon on the Great Deccan line, near to which latter place there is to be a Railway Station. Hingunghat is a very large cotton mart, as already reported. The distance between Hingunghat and the Wurdah along this line is about 45 miles.

12. Two short lines from the Cantonment of Kamptee remain to be noticed. The one to Patunsaongee, a distance of 14 miles, connecting the Cantonment with the southern Imperial line towards Chindwarra and the north, and the other to Goomtarah, about 14 miles, to connect Kamptee with the east and west Imperial line towards Bhundarra. These two roads are required mainly on Military grounds, to facilitate the march of Troops from the Head Quarters Station of Kamptee towards the districts east (Bhundarra and Raepoor) and north (Chindwarra, Baitool, Hoshungabad, &c., &c.).

13. With these the list of Provincial requirements may be closed. Of the Imperial lines, the Great Deccan and Southern Roads are already under construction, the first named being a 1st class road, and the other a 2nd class road on a 1st class basis. The eastern line is also sanctioned, and two Sections, comprising the distance between Seetabuldee and Bhundarra, are under construction. This is a 2nd class road.

The remaining Provincial lines should all be of the 2nd class, with the exception probably of the proposed line between the Raepoor District and the Eastern Coast, for which a less expensive class of road might, in the first instance, be found sufficient.

14. The extent to which these lines of road will be affected by the line of Railway now in progress from Bombay to Nagpoor by Oomraotee, and through the valley of the Nerbudda with a branch to Jubbulpoor, and eventually to the Ganges, must be considered.

[*P. W. Dept.*] 15. The only line of road that will be in any way affected by the Rail is the Great Deccan Road, and this only very partially. Beyond the limits of this Province, that is, from Jubbulpoor to Mirzapoor, the Rail and the road from their proximity may be viewed as antagonistic by those who consider a good road along a line of Railway to be unnecessary. But between Jubbulpoor and Nagpoor, a distance of 160 miles, there is no Rail or branch Rail in contemplation; whilst the natural difficulties of the country between these two points make it improbable that any attempt to connect them by Rail will ever be made. From Nagpoor, however, westward, as far as the boundary of the Province near Nachengaon, the road and the Rail will run side by side; but here any rivalry between them will terminate, the Rail turning to the north-west towards Oomraotee into Khandeish, while the road continues on its course to the southward of west in the direction of Jaulnah, Aurungabad, Ahmednuggur and Poona, at which latter place it meets a branch line of Railway connecting that Station with Bombay. In a Military point of view, therefore, the importance of the Great Deccan Road in this Province ought not to be materially lessened by the introduction of the Rail, for it will still be required to maintain our communication with Seonee and Jubbulpoor to the north, and with Jaulnah, Aurungabad, Ahmednuggur and Poona to the west.

16. The entire length of the three Imperial lines of road within this Province may be set down at 649 miles. The number of miles of the projected Provincial lines is about 762, making a total of 1,412 miles, divided amongst 10 lines, one of which is of the 1st class, eight of the 2nd class, and one of the 3rd. Estimating for these at our present rates, an outlay of 47½ lakhs would be needed for their completion, a portion of which would be borne by the local funds.

	Miles.
Great Deccan	104
Southern line	225
Eastern "	320
Total Miles	649

	Lakhs.
100 Miles, at Rs. 7,000	7
1,000 " " " 3,750	37½
300 " " " 1,000	3
Lakhs	47½

17. Of the District lines, those connecting the several Tehseeldarees with the Sudder Stations of their respective districts and with each other, are the first in importance. The next being the opening of cross lines to connect the Tehseeldarees and the principal marts and bazars with the Provincial and Imperial main lines and with each other. These District lines are too many in number to enumerate here, but their aggregate length may be estimated at 1,000 miles. They may all be of the 4th class, or what are commonly denominated fair-weather roads; and taking the expenditure needed for their construction at Rs. 250 a mile, would involve an outlay of Rs. 2,50,000.

18. From the foregoing it will be seen that a scheme of roads, such as the one herein sketched, would require funds to the extent of 50 lakhs of Rupees, supposing present rates to continue—a large sum certainly, though scarcely more than would be warranted by the results. The Annual Revenue of the Territory amounts to little more than 40 lakhs; but with roads of ingress and egress in all directions, the increase that might be looked for would, I firmly believe, yield a very handsome return for an expenditure even of half a million.

APPENDIX H.

[*P. W. Dept.*]

From Secy. to Govt. of India, P. W. Dept. with G. G., to Secy. to Govt. of N. W. P., in the P. W. D.—No. 203, *dated 9th January* 1861.

I am directed by the Governor General to communicate through you to His Honour the Lieutenant Governor, His Excellency's wishes regarding the Monuments to be erected at Cawnpoor over the two wells of unhappy celebrity.

2. Designs for both these Monuments will be forwarded in a few days. That for the well near Wheeler's intrenchment consists of a massive Iona Cross on an appropriate basement.

3. That for the other well west of the Canal will consist of an octagonal gothic screen and platform encircling the closed well. Both the screen and the platform will be executed in stone. Over or by the side of the well will be placed a marble statue.

4. On receipt of the drawings, orders should be issued to the Executive Engineer regarding the first mentioned Monument, the Cross near Wheeler's intrenchment. But His Excellency desires to entrust the construction of the architectural parts of the other Monument to Mr. C. B. Thornhill, C. S., knowing his strong interest in the matter, and his acquaintance with the details of gothic architecture. The statue will be executed in England, and will be contributed to the Monument by the Governor General.

5. Mr. Thornhill should be at once directed to ascertain the exact state of the well—Whether or not it was a brick well? Of what nature and dimensions was the brick-work with which it is believed to have been closed? What is the state of the soil round it?—in view to a determination of the precautions necessary in founding a Monument of the kind intended, the whole platform of whose foundations will be about 60 feet in diameter.

6. It will probably be necessary to remove the Crosses erected by the Soldiers of the 32nd Regiment, and by those of the Artillery. But when this is necessary, they should be re-erected with the greatest promptitude, as near their original site as may be, without interfering with the new Monument.

7. It will be difficult to form an Estimate of the cost of the architectural portion of the Monument, until some part of the stone-work shall have been executed. But I am to request that funds may be supplied to Mr. Thornhill as soon as he is ready to commence; and that he be directed to furnish monthly accounts of expenditure to your Office.

From Secy. to Govt. of India, P. W. Dept. with G. G., to Secy. to Govt. of N. W. P., in the P. W. D.,—No. 269, *dated 25th January* 1861.

I am directed by His Excellency the Governor General, in continuation of my letter No. 203 of 9th instant, to forward with this letter one Drawing on cardboard and one

[*P. W. Dept.*] sheet of Plans, for the Cross to be erected over the well near the site of Sir Hugh Wheeler's intrenchment; and nine sheets of Plans for the Monument near the Assembly Rooms.

2. The former design is by Mr. G. E. Street, Architect of Montague Place, Bedford Square, London; the latter by the Secretary in this Department.

On the face of the Cross.

"In a well under this Cross were laid, by the hands of their fellows in suffering, the bodies of men, women, and children, who died hard-by, during the heroic defence of Wheeler's intrenchment, when beleaguered by the Rebel Nana, June VIth to XXVIIth, A. D. MDCCCLVII."

On the face of the Pedestal of the Cross.

"Our bones are scattered at the Grave's mouth as when one cutteth and cleaveth wood upon the earth. But our eyes are unto Thee, O GOD the LORD." *Ps.* CXLI.

On the Well within the Screen.

"Sacred to the prepetual memory of a great company of Christian people, chiefly women and children, who near this spot were cruelly massacred by the followers of the Rebel Nana Dhoondopunt, of Bithoor, and cast, the dying with the dead, into the well below, on the XVth day of July, MDCCCLVII."

3. The Cross will bear inscriptions on the face of the standard and on the pedestal respectively. The inscription for the other Monument will be engraved round the rim of the well. These inscriptions are given in the margin.

4. Special precautions will be required for the foundations of both these Monuments, but especially of the larger one. For this a solid platform of concrete should be laid in over the whole surface, and bonded with hoop iron. The actual site of the well should be arched or vaulted over.

5. A small drain should be carried round the exterior of the building. This has been omitted in the Drawings.

APPENDIX I.

[*P. W. Dept.*]

Ordered, as follows, in connexion with the paragraphs of each section of the Report as marginally noted:—

SECTION : MILITARY.

Para. 2.

1. *Meaday.*—With reference to the demolition of the entrenchment here, the Local Government will decide and issue such instructions as may be necessary; the withdrawal of the Troops has been ordered.

2. *Thyet Myo.*—With reference to the recommendation that the roofing and completion of the store godowns inside the Redoubt should be proceeded with *immediately*, in order that "stores, ordnance, and commissariat may be speedily removed from Meaday," His Honour the President in Council remarks that the Pegu Budget for 1861-62 provides for quarters within that Redoubt for Warrant and Non-Commissioned Staff of the Ordnance and Commissariat Departments, for a Laboratory, and for a Forge-shed and Workshops. For the first of these buildings the receipt of an Estimate will be awaited. The others are understood to be within the powers of sanction of the Local Government. Regarding an Ordnance Godown and Ordnance Magazine, the arrangements of the Local Government in connexion with the Budgets of 1860-61 and 1861-62 are approved, as regards the provision of funds. The work has already been sanctioned. All these buildings are of urgent importance, and no time should be lost in providing them.

Para. 3.

3. *Thyet Myo.*—With reference to the remark that "Barracks (permanent) for a Regiment of European Infantry will be needed as soon as practicable," the subject has already received the attention of His Honour the President in Council. The orders of the Government of India on the subject appear in letter No. 4508 of 1st September 1860, from this Department to the Commissioner of Pegu; and the Report of the Chief Engineer, Pegu, on the subject of iron Barracks for Thyet Myo, therein called for, is awaited. Major General J. Bell, Commanding in Pegu, in a Memorandum dated 3rd December 1860, has recorded a very unfavourable opinion of iron Barracks, and recommends wooden structures. His Honour the President in Council directs that a copy of General Bell's Memorandum be sent for consideration by the Chief Engineer, Pegu, in connection with the Report called for; and that the test of the thermometer be applied to the iron Church at Rangoon, and simultaneously to some wooden building, as nearly similar as possible as regards circumstances of occupation, size, &c.; and that the results be reported under the two different cases of external air being freely admitted by doors being left open, and of its being, as far as under ordinary circumstances may be possible, excluded. The Government of India understands that iron having been largely tried for Railway buildings in England, has been generally given up, and is disposed to think many of General Bell's objections to that material are valid. They should be duly considered and reported on.

[*P. W. Dept.*] 4. *Tounghoo.*—The Report recommends that permanent buildings should be commenced on a reduced scale for a Wing of Infantry and for one Company of Artillery. But the proposal of the Local Government, as contained in the Budget of 1861-62, is to shingle the roofs of the European Infantry Barracks, which are reported to be "the best in the country," and to construct permanent Cook-houses. The Local Government should report whether anything beyond this is now thought desirable. Without very strong grounds shown, the Government of India is indisposed to sanction anything further.

Para. 5.

5. The Report recommends the completion of the Redoubt and the works within it. Provision for the former and partial provision for the latter has been made in the Budget of 1861-62; but it is understood that beyond that provision a further sum of Rs. 73,660 will be required for the completion of Ordnance and Commissariat Godowns, unless reduction of force at Tounghoo should admit of reduction in size of these buildings. This will probably be the case; but further information is desired.

6. *Bassein.*—The Report notices the unfinished state of the Magazine at this Station, and recommends its completion. The attention of the Local Government is directed to the subject.

Para. 7.

7. *Rangoon.*—The Report recommends the construction of permanent buildings for a Wing only of an European Regiment in the first instance, though it is desired that the design should be arranged for an entire Regiment. Similar buildings are also recommended for a Reserve Company of Artillery. The Report also urges that Rangoon should have priority of construction of such permanent Barracks, and in this the Government of India fully concurs. They are also recommended for Thyet Myo and Tounghoo. But the Local Government, in forwarding the Budget of 1861-62, declares its wish to shingle the existing Rangoon European Infantry Barracks merely as soon as money shall be available, whilst it apportions funds both for the new Barracks at Thyet Myo and for improving the old Barracks at Tounghoo. In this wish to diminish the risk of fire to the Rangoon Barracks, which are of wood, the Government of India participates, and would gladly have them shingled. It is not understood that the European Troops suffer in health in their present quarters. General Bell in his Memorandum distinctly implies the contrary. Where hardly any Barracks at all exist, as at Thyet Myo, and more Barracks of some kind must be constructed, it may be matter of consideration whether such Barracks shall or shall not be of the description called permanent. But nothing more than semi-permanent Barracks should be erected till it is clearer than at present that European Troops will always be required at Thyet Myo and Tounghoo; and where, as at Rangoon and Tounghoo, Barracks are found which, at a comparatively small expense, may be made semi-permanent, all the Government of India is disposed to do is to substitute a better style of roofing for the thatch which at present exists.

Paras. 8, 14, and 15.

8. *General.*—It is stated in the Report that the Barrack accommodation heretofore provided for the Madras Native Troops, will, under the new arrangements, no longer be needed. Only Regimental buildings similar to those allowed in the Bengal Presidency will be required. Such is the case ; and the Local Government should arrange, as early as practicable, for the sale or profitable disposal in other way of such buildings as are no longer required. The Government of India directs that the proceeds of these buildings be devoted in enhancement of Budget allotments, in consideration of the changes ordered involving some extra outlay in the Public Works Department. [*P. W. Dept.*]

Para. 13.

SECTION : CIVIL.

9. *Thyet Myo.*—The Customs Establishment, if any be maintained, will be moved from Meaday to Thyet Myo, and a Plan and Estimate for a Custom House at the latter place will be required. Similarly with regard to a District Treasury, contingent on changes proposed in the Civil Memoranda of the Report.

Para. 1.

10. Regarding a District Jail at this place, however, and indeed with regard to Jails generally in the Province, His Honour the President in Council directs that no considerable expense shall anywhere be incurred until the whole subject shall have been considered and reported on by the Local Government, aided, if possible, by a competent Jail Inspector. All life prisoners should be sent to the Andaman Islands whenever such a course is legally practicable. Life prisoners who cannot be so transferred, and other long term prisoners, must be retained within the limits of the Province ; and the Government of India desires to be informed whether any Island exists on the Arracan, Pegu or Tenasserim Coasts, suitable for the location of this class of prisoners, where they may be worked with less restraint and at smaller expense as regards guards and jail walls than on the main land. In the meantime, the large available space in the Rangoon Jail should, as far as possible, be made use of.

Para. 2.

11. For all other Convicts, Jails in which in-door labour can be carried on will have to be provided.

12. This subject should not be lost sight of.

13. *Prome, Henzadah, and the Tharawaddy Districts.*—Should it be decided that these Jails are no longer required, the Government of India desires to be informed what is proposed to be done with the old buildings.

Paras. 3 and 5.

14. *Prome.*—The attention of the Local Government is drawn to the suggestion in the Report that some of the Military buildings about to be vacated may be devoted to Cutcherry accommodation.

Para. 4.

[*P. W. Dept.*]

15. *Bassein.*—For remarks applicable to a Jail at this place, see paras. 10, 11, and 12. The Local Government will note the reported necessity for a Court House, and should make some suggestion regarding it.

Para. 7.

16. *Tounghoo.*—Possibly, on the re-arrangement of the Station consequent on the reduction of the European Force, and on Barracks for Native Troops being no longer needed, some substitute may be found for the Court House, Custom House, and Timber Agency, which have been reported necessary. Regarding the Jail required, the orders appearing in paras. 10, 11, and 12 are applicable.

Para. 8.

17. *Rangoon.*—The permanent Court House here must stand over until the Local Government is able to apportion funds for its commencement. Orders regarding Deputy Jailor's quarters, Male Debtors' Prison, Sewerage, Drainage, and minor buildings, ward for female debtors and criminals, and the Head Jailor's house, all in connexion with the Rangoon Jail, will be issued separately. The general question of extra wards in this Jail for from 500 to 700 prisoners, should be brought forward in a definite shape with reference to paras. 10, 11, and 12.

Para. 9.

18. The completion of such of the Dalla Dock Yard buildings as have been commenced is approved to the extent of funds available within Budget limits.

Para 10.

19. The Local Government is desired to report on the subject of the Bonded Ware-house, stated to be necessary, and to submit proposals regarding it.

Para. 11.

20. *Prome and Rangoon.*—It is probable that no immediate necessity will be found to exist for any large outlay on Central Telegraph Offices at these places, although the necessity of eventually constructing such buildings may be admitted. Possibly use may be made for the Electric Telegraph Department of some of the Military buildings which will be evacuated.

Para. 14.

21. *River communications.*—The importance of continuous water communication between the Pegu and Sittang Rivers, advocated in the Report, is fully admitted, and the Government of India has under its consideration separately the Chief Engineer's project for improving the existing line, regarding which orders will hereafter issue. The subject is moreover further treated below.

Para. 15.

22. The Government of India will await the receipt of a project for improving navigation between the Rangoon and Irrawaddy Rivers, data for the preparation of which are being collected; and will welcome any well matured projects, having, as their object, the improvement of important lines of river navigation at a reasonable cost.

Para 16.

23. *Roads.*—Regarding the following subjects, viz., road from Rangoon to Prome, [*P. W. Dept.*]
Paras. 17, 18, and 19. preference of river trunk lines of communication to trunk roads in Burmah, and cross roads, the Government of India concurs with the opinions expressed in the Report.

24. A road from Pegu to Sittang is reported to be an exception to the general
Para. 20. principle of not at present attempting main lines of communication by road; and the Report recommends that this road should at once be surveyed and reported on. His Honour the President in Council has reason to think that this line of road, crossing the drainage of the country, would be very expensive, both to construct and to keep in repair, and that, when made, it would be of far less benefit to the country than a canal. The course which His Honour the President in Council has determined to adopt is to call on Mr. T. Login for an amended project and rough Estimate for a canal, capable of passing country boats and timber (not a canal for steamers, such as he formerly planned, and which resulted in an estimate of high figure,) of the most inexpensive description, completing the communication between the Pegu and Sittang Rivers. This project will then be laid before the Commissioner for an expression of his opinion, and for the submission of a rough Estimate of the cost of the road proposed, consequent on the receipt of which it will be determined whether a detailed Project and Estimate for such a road should or should not be submitted.

25. *Rangoon. Establishments.*—It is stated in the Report that two Executive
Para. 25. Engineers, one for the Town and a second for the Cantonment, will continue to be required until the Dalla Dock Yard shall be completed; after which one Executive Engineer with an Assistant will suffice. His Honour the President in Council desires that this matter should be the subject of further report by the Commissioner, who should consider whether greater efficiency and economy might not at once be secured by amalgamating the two appointments under a 1st Class Executive Engineer with an Assistant.

26. *Henzadah. Establishments.*—The proposition to abolish the Henzadah Di-
Para. 26. vision is approved, retaining only a small Establishment for the Henzadah and Tharawaddy Districts; but His Honour the President in Council doubts the advisability of placing such Establishment under the direct control of the District Civil Officers. Further report by the Local Government on the details of this proposal is desired.

27. *Thyet Myo. Establishments.*—The Report states that here an Executive
Para. 29. Engineer and two Assistants will be required. His Honour the President in Council is disposed to think that, consequent on the abandonment of Meaday, one Assistant should suffice; but will await further report from the

[*P. W. Dept.*] Local Government regarding the duties which still are supposed to demand the retention of two Assistants.

28. *General Establishments.*—The Report recommends an increase of salary to the Chief Engineer from Rs. 800 to Rs. 1,000 per mensem, on the ground that his present salary is less than what is allowed for a similar charge at Mysore, Nagpoor, Hyderabad, and the Straits Settlements. This is partly true; and the disbursements in the Pegu, Tenasserim, and Martaban Provinces are, no doubt, materially heavier than in the abovenamed Administrations. The Government of India is also highly satisfied with the discharge of Captain C. D. Newmarch's duties. Should the Pegu, Tenasserim, Martaban, and Arracan Provinces be united, the Government of India will bestow its favourable consideration on this proposition of increase of salary.

Paras. 36, 37, and 38.

APPENDIX J. [P. W. Dept.]

ACCIDENTS ON RAILWAYS IN INDIA DURING THE YEAR 1860.

Accidents attended with Injury to Life or Limb.

I. ACCIDENTS TO PASSENGERS.

East Indian Railway, Bengal Division.

FATAL	2	3
INJURY	1	

There have been only three accidents to passengers during the year on the line opened to traffic.

No. 1. *Fatal.*—On the night of the 8th June, a European traveller fell out of a 2nd class carriage and was killed on the spot.

No. 2. *Fatal.*—On the 21st November, a similar accident took place, the deceased being a European Carpenter in the Railway Company's employ.

No. 3. *Injury.*—On the 8th December, a Passenger Train ran into a Goods Train at Bally, and three of the passengers were slightly bruised; the Driver of the Passenger Train and the Guard of the Goods Train were fined Rs. 100 and 150 respectively.

East Indian Railway, N. W. Provinces.

FATAL	2	2
INJURY...	Nil	

No. 1. *Fatal.*—February 19th. A passenger (Chuprassee) while attempting to alight from the Train when it was in motion, received a severe injury. He was immediately sent to the hospital, where he died.

No. 2. *Fatal.*—September 11th. A man while attempting to get into the Train when it was in motion, was run over and killed.

Madras Railway.

There were no accidents to passengers on the Madras Railway during 1860.

Great Indian Peninsula Railway.

FATAL	Nil	2
INJURY	2	

No. 1. *Injury.*—August 11th. A 1st class passenger was slightly hurt in the knee, from the carriage in which he was sitting being thrown off the rails, owing to a defect in a switch crossing.

[*P. W. Dept.*] *No.* 2. *Injury.*—July 4th. One passenger, through his own carelessness, fell out of the horse-box, and was slightly bruised.

Bombay, Baroda, and Central India Railway.

There were no accidents to passengers on this line during 1860.

II. ACCIDENTS TO SERVANTS OF THE RAILWAY COMPANY, OR PERSONS EMPLOYED ON RAILWAYS.

East Indian Railway, Bengal Division.

Fatal	16	20
Injury	4	

The accidents under this head have been numerous and severe, and are briefly noted below.

No. 1. *Fatal.*—On the 3rd February, at Ahmoodpoor, a khalassee trying to get on a Train in motion was killed in the attempt.

No. 2. *Fatal.*—On the 19th March, a coolie employed in shunting waggons at Burdwan, fell down, and the wheel of a truck passed over his arm, breaking it; he died from the effects of the injury.

No. 3. *Fatal.*—On the 23rd of March, near the Adjai Brick-field, a woman trying to cross the line while some trucks loaded with bricks were being pushed along, fell down, and a waggon passed over her, killing her on the spot.

No. 4. *Fatal.*—On the 29th March, a coolie was run over and killed at the Buckesor Bridge; he was employed in carrying bricks to the works, and although warned not to go on the open line, he walked along it, carrying a load of bricks; the Train came in sight and he got upon the parapet of the Bridge, where had he remained he would have been safe, but losing nerve as the Train came up, he jumped down from the parapet and tried to run along the Bridge in front of the Train, he was caught by the Engine, knocked down, and killed.

No. 5. *Injury.*—On the 2nd April, a spark from the Engine ignited some straw in two waggons of a Ballast Train, and six coolies were slightly injured.

No. 6. *Fatal.*—On the 17th April, a Goods Train ran into a Ballast Train during a dust storm near Hooghly; two men were killed and two more were injured severely.

No. 7. *Fatal.*—On the 3rd May, one of the new four-wheeled Ballast Engines was upset near Mullarpoor, and two native cleaners who were riding upon it were scalded to death; the accident occurred at the foot of an incline, and it is supposed that on reaching the bottom of the incline the Driver put on steam too suddenly, which caused the Engine to jump off the rails and to overturn.

No. 8. *Injury.*—On the 20th August, a porter had his foot crushed by the Pilot En- [*P. W. Dept.*]
gine in Howrah yard.

No. 9. *Fatal.*—On the 23rd September, a Native was killed near the Chandmaree Crossing at Howrah, in the attempt to cross the line in front of an approaching Engine.

No. 10. *Fatal.*—On the 26th September, a permanent way coolie was run over by a Train near Hooghly and killed; he appears during a storm to have seated himself upon the rails, and to have been caught by an Engine coming up behind him.

No. 11. *Fatal.*—On the 28th September, a coolie employed in shunting waggons at Synthia, was crushed between two waggons and killed.

No. 12. *Fatal.*—On the 2nd October, shortly before the opening of the line to Rajmahal, a serious accident attended with great loss of life occurred near Nulhatty; the cause of the accident could not be positively determined; it has been attributed by the District Engineer and by the Chief Engineer to the spring and horn plate of a truck suddenly giving way, causing it to break down; an engine and seventeen trucks were thrown off the rails, all of which were much damaged; some of these trucks were loaded with sleepers on which a number of coolies were seated. The sleepers being loose were thrown about, seven coolies were killed on the spot, six more coolies died subsequently, and ten others were injured.

No. 13. *Fatal.*—On the 13th October, a Ballast Engine driven at too high speed got off the line near Rajmahal and upset across the rails, crushing to death the Native Fireman.

No. 14. *Fatal.*—On the 8th November, a greaseman in trying to jump from a horse-box to the platform at Pundooah after the Train had started, fell and was killed.

No. 15. *Injury.*—On the 8th December, a European Fireman missed his footing in getting on to his Engine, and his foot was crushed.

No. 16. *Fatal.*—On the 15th December, a coolie was run over and killed at the Burdwan Station.

Besides the foregoing, the following accidents have occurred during the year in connection with the Railway works:—

No. 17. *Injury.*—A Blacksmith had his arm broken by a steam hammer on the 23rd January.

No. 18. *Fatal.*—On the 16th March, two coolies were killed and one was injured whilst taking a waggon (used for conveying iron girders) too quickly down a slope near Pulsa.

No. 19. *Fatal.*—Two coolies were killed in the Howrah Yard on the 14th July, by the falling in of part of the roof of the new segmental Engine Shed whilst under construction.

[*P. W. Dept.*] *No.* 20. *Fatal.*—A carter employed on the Singarrun Extension works fell from his cart and was killed, the loaded cart passing over him.

East Indian Railway, N. W. Provinces.

Fatal...	...	...	1	2
Injury	...	...	1	

No. 1. *Fatal.*—September 13th. A lorry was going faster than the Inspector in charge wished it to do, and a coolie who jumped off to reduce its speed was run over and killed.

No. 2. *Injury.*—September 21st. A coolie engaged with some others in pushing three ballast waggons was, by some inattention on his part, run over and injured in his leg and arm.

Madras Railway.

Fatal ...	...	...	2	3
Injury ...	...	...	1	

No. 1. *Fatal.*—A carpenter was run over near the Perambore Workshops, and his legs were nearly cut off by the Arconum Special Train of 25th February 1860. The accident happened between 5 and 6 in the morning, and the man died at about 10. The statements made by the deceased were so conflicting, that the original cause of the accident was not clearly ascertained. It would appear, however, to have been the result of want of caution on the part of the deceased.

No. 2. *Fatal.*—Mr. Millitt, the Foreman of the Perambore Waggon Shop, was killed on the 23rd of May by the falling of a Derrick, used at the Perambore Workshops for the purpose of lifting timber on to trucks. This Derrick was kept in its position by four ropes or gyes, two of which were made fast under the rail of the northern of the two sidings near the workshop. These two ropes appear never to have been altered, and engines had frequently passed under without touching them. It was usual, however, to slacken the other two ropes, which passed from the Derrick southward, in order to allow the Derrick top to overhang the rails when timber was being loaded on to trucks; and it was the opinion of the Locomotive Superintendent, that when last slackened, they had not been tightened again as much as usual, for the accident resulted from the Engine striking the northern ropes and thus bringing down the Derrick.

This does not, however, seem to have been the case, as, from inquiries made at Perambore, it appears that the Derrick had been erected in the same position for some three months, and though for four or five days immediately before the accident happened it had not been worked, an Engine had during that time passed under it.

Great Indian Peninsula Railway. [*P. W. Dept.*]

Fatal	12	25
Injury	13	

Twelve servants of the Company were killed, and thirteen hurt, during the course of the year. The causes were as follows :—

In collisions	1	killed and	2	injured.	
In shunting	3	"	"	1	"
In attempting to get on Trains, or by falling off Trains in motion	3	"	"	3	"
Run over by Trains	4	"	"	5	"
Miscellaneous, not connected with the running of Trains	1	"	"	2	"

Bombay, Baroda, and Central India Railway.

Fatal	Nil	1
Injury	1	

No. 1. *Injury.*—There was one accident that occurred, resulting in the fracture of the leg of one of the Guards, caused by his coming in contact with the parapet wall of a bridge while attempting to close the door of a third class carriage when in motion.

III. ACCIDENTS TO PERSONS NEITHER PASSENGERS NOR SERVANTS OF THE RAILWAY COMPANIES.

East Indian Railway, Bengal Division.

Fatal	5	8
Injury	3	

No. 1. *Fatal.*—On the 18th February, a Native was run over by a Train and killed near Bydabatee; the man was thought to have been intoxicated.

No. 2. *Fatal.*—On the 2nd May, also near Bydabatee, a Native trespassing on the line was run over and killed by one of the Up Night Trains.

No. 3. *Fatal.*—On the 25th June, a Native boy was run over and killed near Undal.

No. 4. *Fatal.*—On the 29th August, the body of a Native was found near Mymaree; he was supposed to have been trespassing on the line, and to have been run over by one of the Night Trains.

No. 5. *Injury.*—On the 3rd September, a Native was knocked down when attempting to cross the line in front of an Engine at Chandmaree, but the man was not much hurt.

No. 6. *Injury.*—On the 16th October, a Native who was trespassing on the line was knocked off a bridge by the Engine piloting the Special Train on its return from the Rajmahal opening.

[*P. W. Dept.*] *No. 7. Injury.*—On the 3rd November, a coolie in trying to cross the line near Rajmahal was knocked down by an Engine, but was not killed.

No. 8. Fatal.—On the 18th November, a Native in attempting to cross the line near Pakour in front of a Train, was knocked down and killed.

Madras Railway.

There were no persons injured or killed on this Railway, either by trespassing or suicide.

Great Indian Peninsula Railway.

Fatal	2	3
Injury	1	

There were three cases reported, two of which resulted in death. A man attempting to cross the line when intoxicated was killed. Another man was found lying dead close to the rails, and his death was attributed to his having been struck by an Engine. In the third case a boy was knocked over by the buffer of an Engine, and his arm fractured.

Bombay, Baroda, and Central India Railway.

No Accident.

IV. MISCELLANEOUS ACCIDENTS, AND ACCIDENTS FROM COLLISIONS, OR ENGINES OR CARRIAGES LEAVING THE RAILS.

East Indian Railway, Bengal Division.

On the 5th April, the Night Up Mail ran over a bullock near Paneeghur, and the Engine was slightly injured.

East Indian Railway, N. W. Provinces.

January 9th.—An uncovered truck filled with soldiers' baggage, coupled next to the Engine, took fire between Berhampoor and Khaga Station, from a spark from the Engine, and destroyed a portion of the baggage. The Locomotive was not then fitted with an American Chimney.

March 28th.—A slight damage by fire to a Goods Waggon and to the property of a soldier of Her Majesty's 71st was caused by a lighted wick supposed to have been thrown on it by a soldier of Her Majesty's 80th Regiment. The soldier was tried by a Court Martial and acquitted.

May 26th.—While a coolie was releasing the handle of the points, a Pilot Engine ran off the line and broke a few chairs. The man was fined.

June 4th.—A spark from the Locomotive Engine of the 5-30 A. M. Down Goods Train [*P. W. Dept.*] caused a fire, which resulted in a loss of about Rs. 30. The fire was supposed to have originated from the fire box.

July 24th.—Detention of Up Goods Train at the Khaga Station of 8 hours, caused by the axle of one of the Trucks being a little out of gauge.

August 13th.—The Down Special Train was delayed three hours between Khaga and Berhampoor by the breaking of the wooden trenails. Some sleepers were displaced and rails bent, but the extent of damage done to Rolling Stock was not known. Instructions were issued to secure each rail by two iron spikes. The line was blocked up the whole of the next day, rendering it necessary to transfer passengers from Up to Down Trains, and vice versa.

September 5th.—The want of a signal lamp to the Pilot Engine caused a collision. A pair of lorry wheels were broken, and the body of the lorry damaged. Strict orders were issued, that after dark no Engine or other vehicle should be out on the line without head and tail lamps.

September 17th.—By the failure of the wooden trenails, the Up Goods Train ran off the line and caused several hours' detention. Two buffers and one chair coupling were rent asunder, and about 25 yards of permanent way were much broken up.

September 25th.—An hour's delay occurred at Allahabad by the Up Passenger Train running off the line; the line being out of gauge from the failure of the wooden trenails.

October 16th.—A spark from the Engine of the Up Goods Train falling on the tarpaulin covering of a waggon, originated a fire, causing slight damage to five waggons and some grain with which they were laden. The fire was speedily extinguished.

November 21st.—Some hours' delay to the Goods and Down Passenger Trains occurred by the Up Goods Trains running off the line, displacing ten rails and a few pins, and breaking some keys. The Fort Station Master and the Guard were reprimanded.

December 28th.—The Down Passenger Train destroyed the crossing gates by running through them. The gatemen were not at their posts. They were forcibly carried away by some soldiers to show them the way to the Barracks. They ran back the moment they were released, but arrived too late to show the signal lamps or open the gates. The men were tried and acquitted by the Magistrate.

Madras Railway.

There were four accidents, two from Engines and carriages leaving the line; one from waggons going off the line, owing to defective working of points, and one from a Goods Train taking fire.

[*P. W. Dept.*] The first, in point of time, was attributable to the imperfect condition of the permanent way over a small timber bridge near Trivellum. The persons in fault, a maistry and a watchman, were tried and sentenced, the first to 18 months' imprisonment with hard labour, and the second to one year of the same.

The second was the accident arising from the imperfect working of the points of the Perambore Station siding. The expansion of the rails between the crossing and the points had driven the tongue forward a quarter of an inch, bringing the link piece of the lever bar to bear upon the edge of the slot in the web of the rail, and lifting the tongue in closing, so as to bring its point against the upper table of the rail, prevented its closing properly.

The third was caused by fire. It occurred to the 8-49 A. M. East Goods Train, at five miles from the Chinnamapett Station. The cause is believed to have been the overlapping of one of the tarpaulins, which brought it into contact with the break block, a spark from which is supposed to have set it on fire.

The fourth appears to have been the result of defects in the permanent way, which caused the break van belonging to the Special East Goods Train from Vellore to leave the line. This was followed by a horse-box, the only vehicle behind it, and the permanent way was in consequence torn up for about three-quarters of a mile.

An accident which occurred on the 13th December 1859, was not entered in the Return for that year, as it had not been fully investigated when the document was prepared. It will not be correct to enter it in the Return for 1860, but it may here be stated that it happened to a Train between the Chinnamapett and Companypett Stations, and is to be attributed to the trenails of the permanent way proving insufficient to secure the line, in consequence of which it was decided to substitute an iron spike for every alternate trenail.

Great Indian Peninsula Railway.

Fifty-two accidents in all were reported. They were as follows:—

10 cases of collisions, causing death to one and injury to two Railway servants.
3 " of Engines and waggons getting off rails through carelessness of pointsmen.
5 " of gates being run through.
14 " of Cattle being killed by Trains on the line.
8 " of Engines and waggons getting off the line through defects in rails or crossing points, or carelessness of Driver, resulting in injury to passenger.
6 " of waggons catching fire.
2 " of waggons parting at couplings.
3 " of waggons running over obstructions on line.
1 case of a loading crane upsetting, and causing injury to one of the Company's servants.

Bombay, Baroda, and Central India Railway. [*P. W. Dept.*]

No Accident.

REMARKS.

Three Statements are attached to this Report, one showing all accidents attended with injury to life or limb, giving the number of persons killed or injured from all causes; the second showing the nature of all accidents, whether collisions, Engines or carriages leaving the line, accidental, &c., &c.; and the third showing the comparative number of passengers killed or injured with reference to the numbers carried, and also as compared with accidents on English Railways.

In the year 1860, the Bombay, Baroda, and Central India Railway shows the fewest accidents, there having been only one, causing injury to a Railway servant. It is however to be observed, that only a very small portion of this line of Railway was opened for traffic in July 1860.

The Madras Railway next shows fewest accidents, and the Great Indian Peninsula Railway the largest number. On the former, four only occurred, in which no passenger was either killed or injured; on the latter, fifty-two accidents occurred, two of which resulted in the slight injury of two passengers, one from unavoidable circumstances, the other from carelessness on the part of the passenger.

On the East Indian Railway, Bengal Division, there were twenty-nine accidents, and on the North-Western Provinces Division there were twelve—of the former, three resulted in the death of two passengers owing to their own carelessness, and injury to three from causes beyond their control; of the latter, two occurred to passengers, both resulting in death, owing to their own carelessness.

Of the total number (98) of accidents on all Railways, eighteen were occasioned by negligence of Railway servants, thus:—

In Bengal	5
" North-Western Provinces	2
" Great Indian Peninsula Railway	11
Total ...	18

There was one accident on the East Indian Railway, Bengal, in which the Driver of a Passenger Train and the Guard of a Goods Train were considered to blame, they were both fined.

In the North-Western Provinces Division a coolie was fined, and the Allahabad Fort Station Master was reprimanded.

[*P. W. Dept.*] On the Madras Railway a maistry and watchman were tried, owing to the imperfect condition of the permanent way of a small bridge. They were found guilty and sentenced to imprisonment with hard labour.

There have been several accidents from collisions and of a miscellaneous nature, the largest number having occurred on the Great Indian Peninsula Railway; the miscellaneous accidents, however, were of a purely accidental nature, and the only one with any serious result was the one that occurred in the Bengal Division, East Indian Railway, shortly before the opening of the line to Rajmahal.

PUBLIC WORKS DEPARTMENT,
The 15th July 1861.

H. HYDE, *Captain,*
Under Secy. to the Govt. of India.

RETURN No. 1.

Number of persons killed and injured from all causes on Indian Railways during 1860.

	East Indian Railway.				Bombay G. I. P. Railway.		Madras Railway.		Bombay, Baroda, and Central India Railway.	
	Bengal Division.		N. W. P. Division.							
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Passengers.										
Passengers killed or injured from causes beyond their own control ...	...	3	...	...	...	1	...	...	...	...
Ditto owing to their own misconduct or want of caution	2	...	2	...	...	1	...	...	...	...
Total Passengers killed or injured ...	2	3	2	...	...	2	...	...	...	...
People connected with the Railway.										
Servants of the Company or of Contractors killed or injured from causes beyond their own control	19	19	1	...	2	3	1	...	...	1
Ditto owing to their own misconduct or want of caution	8	2	...	1	10	10	1	...	...	...
Total Railway people killed or injured ...	27	21	1	1	12	13	2	...	...	1
Others, neither Passengers nor Railway Company's Servants.										
Trespasses	5	3	...	...	2	1	...	...	...	...
Suicide	...	...	...	...	...	...	...	...	...	...
Total persons unconnected with the Railway ...	5	3	...	...	2	1	...	...	...	...
Grand Total killed or injured ...	34	27	3	1	14	16	2	...	...	1
Mean length of Railway open during year	Miles 183·75		Miles 123		Miles 297½		Miles 137		Miles 35¾	
Number of Passengers carried	15,67,200		2,19,708		13,83,724		9,85,010		99,598	

RETURN No. 2.

Statement of Accidents upon Railways in India during 1860, *showing the nature of accidents and number of persons killed or injured thereby.*

Nature of Accidents.	No. of Accidents.	Passengers or persons unconnected with the lines.		Causes of Accidents.											
					Causes arising from Rolling Stock or Road.				Causes attributable to the Management.						
					Neglect of		Defective condition of		Defective Discipline.						
									Unpunctuality.						
		Killed.	Injured.	Purely accidental.	Machinery of Train.	Road.	Machinery of Train.	Road.	Accidental.	Defective or inadequately enforced system.	Insufficient or inadequately enforced Regulations.	Defective system for recurring intervals between Trains.	Negligence of servants.	Improper interference by persons not under the control of the Company.	Malicious attempt of persons not under the control of the Company.
East Indian Railway, Bengal Division.															
Accidents from Engines or Carriages leaving the Rails ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Accidents from Collisions	2	...	3	...	...	...	...	...	...	...	...	...	2	...	...
Accidents from Trains running through facing points ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Accidents from persons in Train being struck against works adjacent to the line	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Accidents, miscellaneous	27	2	...	22	...	...	1	...	...	...	...	...	3	...	1
Total	29	2	3	22	...	...	1	...	...	...	...	...	5	...	1
East Indian Railway, N. W. Provinces.															
Accidents from Engines or Carriages leaving the Rails ...	4	...	...	...	...	...	...	2	...	...	...	...	2	...	...
Accidents from Collisions	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...
Accidents from Trains running through facing points ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Accidents from persons in Train being struck against works adjacent to the line	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Accidents, miscellaneous	7	...	...	6	...	...	1	...	...	...	...	...	...	...	...
Total	12	...	...	7	...	...	1	2	...	...	...	...	2	...	...

Madras Railway.																			
Accidents from Engines or Carriages leaving the Rails ...	2	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...
Accidents from Collisions	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...
Accidents from Trains running through facing points... ...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Accidents from persons in Train being struck against works adjacent to the line	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Accidents, miscellaneous	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total	4	...	...	1	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...
Great Indian Peninsula Railway.																			
Accidents from Engines or Carriages leaving the Rails... ...	11	...	1	...	...	...	...	...	...	...	...	...	...	...	...	11	...	...	...
Accidents from Collisions...	10	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Accidents from Trains running through facing points... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Accidents from persons in Train being struck against works adjacent to the line	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Accidents, miscellaneous	31	2	2	31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total	52	2	3	41	...	...	...	...	...	...	...	...	...	...	...	11	...	...	...
Bombay, Baroda, and Central India Railway.																			
Accidents from persons in Trains being struck against works adjacent to the line	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

[*P. W. Dept.*]

RETURN No. 3.

Statement showing the number of Passengers carried and those killed or injured from causes beyond their own control.

1860.	Total number of Passengers carried.	Total Number		Proportion per Million.	
		Killed.	Injured.	Killed.	Injured.
1. East Indian Railway, Bengal Division	15,67,200	...	3	...	1·91
2. Ditto N. W. P. Division	2,19,708	...	...	...	·00
3. Madras Railway	9,85,010	...	...	...	·00
4. Great Indian Peninsula Railway	13,83,724	...	1	...	·72
5. Bombay, Baroda, and Central India	99,598	...	...	...	·00
Total	42,55,240	...	4	...	·94
Average in Railways in Great Britain	1,39,000,000	...	...	·15	3·19

APPENDIX K.

[*P. W. Dept.*]

Under instructions from Her Majesty's Government, the following amended Rules for taking up land for Railway purposes are issued for adoption in lieu of those laid down in Circular No. 9, dated 16th March 1861 :—

Revised Rules.

1. Land required for Railway purposes may be divided into four Classes, A, B, C, and D. First, Class A, land which a Railway Company receives free of charge, under the contract with the Government, for permanent occupation. Second, Class B, land also provided free of cost, but only for temporary occupation. Third, Class C, land which the Railway Company has to provide at its own cost. Fourth, Class D, land which does not come directly into the possession of the Railway Company at all.

2. Class A will comprise the land required for the permanent works of a Railway, including the road with its bridges, &c., and all stations, workshops, permanent store-houses, and the like, necessary for the line when opened, and which under the contracts is to be provided by Government free of cost to the Railway Companies. The occupation of this land by a Railway Company will be so far permanent that it will only cease when their contract is terminated or surrendered, and the whole lapses to Government. It is all provided free of charge.

3. Class B will contain land essential for the execution of the permanent works of a Railway, but not required after the completion of the line in part or in whole. It also is provided free of charge. Such is land for spoil banks, for extra excavation to make banks, for river diversion, and for the storage of Railway materials held in stock by the Railway Company, pending the construction of the line, or their despatch to the works.* The occupation of this class of land will be temporary. On its restoration to the Government,—the proper time for which will be settled in each case between the Railway Officers and the Consulting Engineer,—it will be for the Revenue Officers to dispose of it to the best advantage of Government.

* This last sort of land is allowed free under the Right Hon'ble the Secretary of State's letter No. 25 of 30th November 1858.

4. Class C will contain the land which a Railway Company has to provide at its own cost. This is land which is required for the provision or preparation of materials; for purposes contingent on the actual execution of the works on the line, or for other miscellaneous objects, which the Government recognizes as falling legitimately within the scope of the Railway Company's operations, though not giving the Company a claim to the provision of land free of charge. As a Railway Company is bound to pay for the construction of all works out of the capital, receiving only from Government without charge the land on which the works stand, the provision of all materials, and the means

[*P. W. Dept.*] of facilitating the execution of all works are to be at the cost of the Railway Company. (*a*) It is proper to bear in mind, in fixing the rent, that this land will in part deteriorate by the use to which it is put, and in part will not so deteriorate. In all cases, however, it will be most convenient to deal with the land in the first instance in the same manner. It will be taken possession of by Government, and handed over to the Railway Company for occupation at a fair rental. When the necessity for occupation ceases, the land will be given up again to Government by the Railway Company, the proper time for this being determined, as under Class B, by the Railway Officers and Consulting Engineer.

5. Class D will contain that land, which, being required in consequence of the works of a Railway, still does not come directly into the occupation of the Railway Company; it will be provided free of charge. It will be exclusively land for roads; either new roads leading to Railway Stations, or to permanent store-yards or workshops detached from the main works, diversions or changes of old roads made necessary by Railway works.

6. Inconvenience is likely to arise if Railway Companies are permitted to hold land on their own account, or otherwise than is above explained. By causing them to rent from the Government all land to which they are not entitled free, in the manner above explained, simplicity in the tenure of their property will be secured, which will be a matter of importance at a future time when the Railway may be transferred to Government. The determination of the value to be paid by the Government for any land not included in Class A which might be held by a Railway Company, would certainly be, in such an event, a great embarrassment.

7. Houses, trees, tanks, or other property, or land which is not provided free of charge, and for which special payment or compensation is necessary, will be paid for, at once, by the Railway Company. In the case of land provided free of charge, the materials, &c., derived from the "clearance" of the surface, which then will be at the expense of Government, will be disposed of by the Revenue Officers to the best advantage.

(*a*) The following words were also in the original rules:—

"In this class, therefore, will fall all land for brick-making, for quarrying ballast,* for houses for persons employed on the work, &c., so also land for houses for Engine Drivers, and the like, on the line when opened, and for other similar purposes, will come under Class C."

But H. M.'s Secretary of State for India thought that any particularization in the rule might raise questions as to the power of Government to alter or vary the terms of the contract (a power which the Government has no intention of claiming). It has therefore been thought best to give these words in a note, simply for the guidance of the Officers of Government and parties interested, as to the construction which Government puts on the contract, in regard to certain points of frequent practical application.

* In the original rules, the words "for roads to works in progress" here found place. They have now been struck out, as calculated to mislead. It is clear a road may be required from a site used temporarily for storage of materials itself in Class B. This would carry the road itself into the same class. A road from a brick-field or quarry would be in the same category as the brick-field or quarry, viz., Class C. Whereas a road from a detached but permanent store-yard, although leading "to works in progress," would not the less come under Class D, should such road still be necessary after the completion of those particular works. Thus, *generally*, the circumstances of the tenure of land *at the end of the road furthest from the Railway* will decide the class into which the road itself shall be placed.

8. All land required for a line of Railway will be applied for in continuous portions: [*P. W. Dept.*] the Plans will be drawn to a scale of 150 feet to the inch, and the measurements and areas will be recorded in accordance with the fiscal divisions of Village Estates or Mouzahs, Pergunnahs, and Zillahs, in a schedule, of which a form is annexed, showing in detail the several classes to which the land belongs.

9. The several classes of land will be coloured pink, yellow, purple, and green respectively in the Plans, and the exact purpose to which each parcel of land is to be devoted, will be noticed in the schedule.

10. Detached portions of land should be referred to some fixed point on one of the main sheets, with such distances and compass or other bearings, as will enable the land to be identified at once. A corresponding entry should also be made on the main sheet to draw attention to the detached portion.

11. The general correctness of the Plans and Schedules of the Railway Engineers being attested by the Consulting Engineers to Government, the applications will be forwarded to and dealt with as may be necessary by the Revenue Authorities under the orders of the Local Government. The Revenue Officers are to be held strictly responsible for the regular adjustment by Railway Companies of all charges on account of land, to be determined in the manner above explained.

12. A complete set of Land Plans should be recorded in the Chief Engineer's Office of each Railway, and a copy forwarded to the Consulting Engineer to Government, by whom a duplicate will be given to the Revenue Board, which in turn will supply Collectors of Districts with transcripts of parts included in their respective Zillahs. When it may be found expedient, in order to expedite the making over of the land, to employ a special Land Commissioner for this duty, the Railway Engineers should supply an additional copy of the Land Plan for the use of the Land Commissioner.

13. The Consulting Engineer to Government and Local Revenue Authorities will respectively be held responsible for the punctual fulfilment of the foregoing orders in their several Departments, and for the careful record of Plans in their respective Offices.

14. All contemplated changes in the land in possession of a Railway Company should be promptly reported by the Railway Agent to the Consulting Engineer to Government, who will notify the same to the Local Government. It will be for the latter to see that the necessary steps are taken by the Revenue Authorites for entering such changes in their records, and for carrying out all further proceedings that are requisite on such an occurrence.

15. It will be necessary for the Local Government to see that a correct register and record of title of all Railway lands is maintained; for the whole of such lands will one day revert to the Crown. Also that all rents or payments for clearances, &c., chargeable in behalf of Government against the Railway Company, are duly realized.

16. It is essential that there should be for each Railway *one* set of Plans, in a regular sequence, to show all the land; and that the Plans of each Railway Company's Estate, after they have once been prepared, should constantly be corrected and always be maintained complete.

[*P. W. Dept.*]

FORM OF SCHEDULE.

Plan. Sheet No.

_____ Railway

_____ District

Schedule of land required for the use of the Railway in

Mouzah _____

Pergunnah _____

Zillah _____

No. on Plan.	Purpose for which required.	PAYABLE BY GOVERNMENT.									PAYABLE BY RAILWAY COMPANY.		
		A (*Pink.*) Land for permanent occupation by Railway Company.			B (*Yellow.*) Land for temporary occupation by Railway Company.			D (*Green.*) Land to be occupied by Government permanently.			C (*Purple.*) Land for occupation by Railway Company permanently or temporarily.		
		A.	R.	P.	A.	R.	P.	A.	R.	P.	A.	R.	P.
1	Synabas Station ...	40	3	7									
2	Spoil bank of Balpoor Cutting ...	..	..	..	13	3	6						
3	For quarrying ballast ...	..	..	..	..	..	...	...	...	...	1	3	2
4	Temporary road from ballast quarry to line of Railway ...	..	..	..	..	..	...	...	...	...	...	3	8
5	Road from Synabas Station to high road ...	..	..	..	..	..	...	1	2	3			
	Total ..	40	3	7	13	3	6	1	2	3	2	2	10

C. D.,

Deputy Consulting Engineer to Govt.

A. B.,

Chief Engineer _____ *Railway.*

Public Works Department Press, O. T. Cutter,—1861.

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